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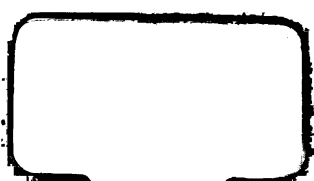
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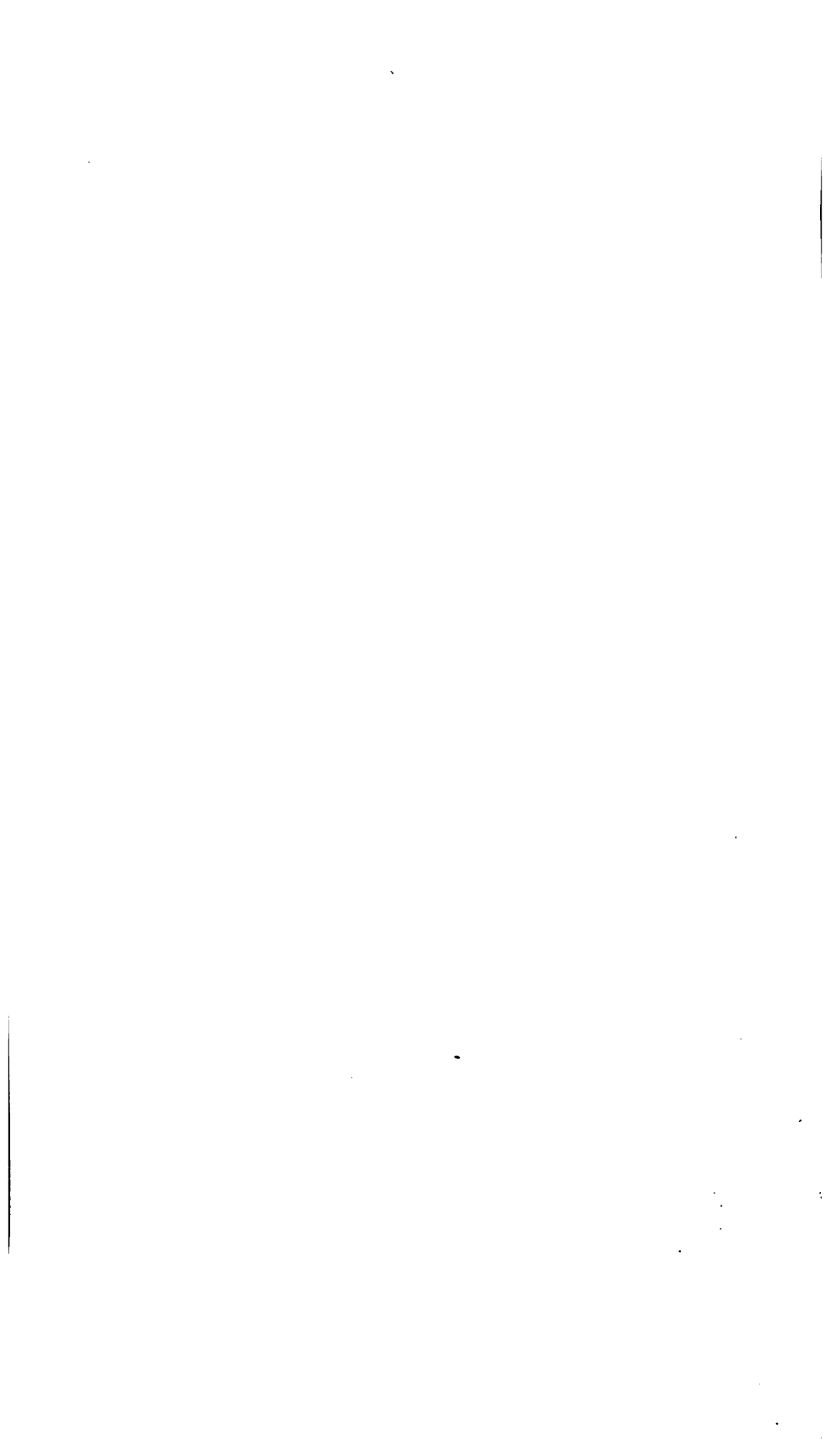
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WAR DEPARTMENT . . . OFFICE OF THE CHIEF OF STAFF.

SECOND (MILITARY INFORMATION) DIVISION.

GENERAL STAFF.

No. 7.

SELECTED TRANSLATIONS

PERTAINING TO
THE TACTICAL USE AND
VALUE OF

MACHINE GUNS.

April 1, 1906.

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GENERAL STAFF PREFACE.

The following translations have been selected for publication to the Army, because they embody the latest published views of continental Europe on the subject, and are well worth most careful study in connection with the organization and use of machine guns in our Army.

The information contained in the following pages has been supplemented by additional items of interest from the reports of our military attachés accompanying the Russian and Japanese armies in the field.

The loss of eight Russian machine guns at the Yalu, where they played an unimportant part, appears to have depreciated that arm for a time in the eyes of the Russian military authorities. On the other hand, the effect of the Russian machine guns on the Japanese in succeeding engagements, more especially at the battle of Nanshan Hill, was such that the Japanese General Staff at once appreciated their importance, not only as a physical but a moral factor in winning battles.

Machine guns had been originally issued to the Japanese cavalry only, but after Nanshan Hill they were supplied to Nogi's army before Port Arthur, and the Russians are said to have suffered considerable loss from Japanese machine-gun fire at the battle of Chen-tan-pu. At the close of the war each of the two Japanese cavalry brigades was equipped with six machine guns, and each infantry regiment with three guns; while it was contemplated giving a uniform equipment of six guns to all regiments, whether cavalry or infantry.

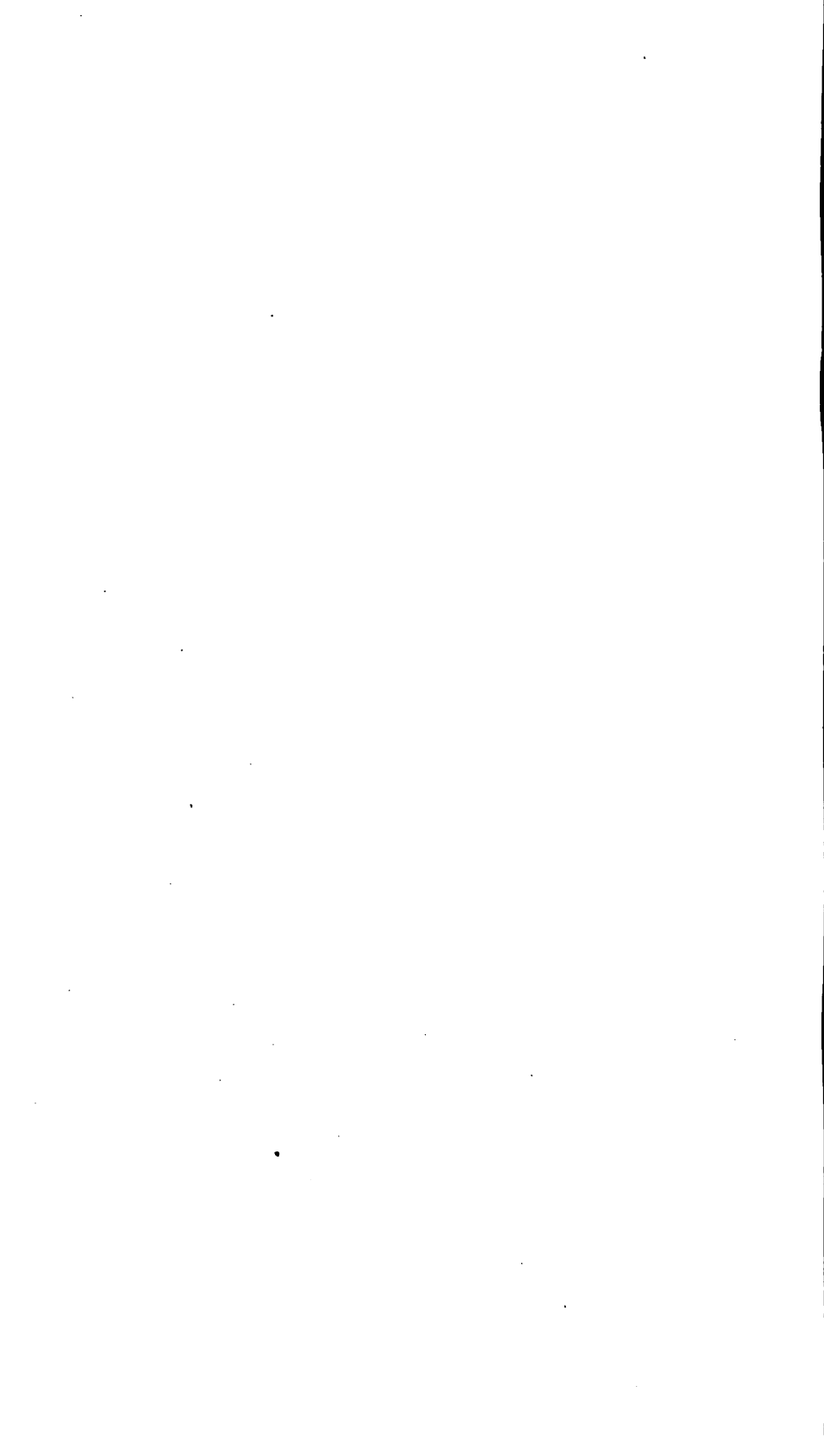
The Japanese machine guns were served by extra-regimental infantry soldiers selected from men having more or less knowledge of mechanics, and the six-gun organization was chosen in order that two-gun sections might be conveniently assigned to detached squadrons or battalions. A larger organization than six guns was said to unduly attract artillery fire, while at least two guns were almost invariably worked together, in order to support each other in retiring, and also in case either gun became disabled.

The Russians did not restrict themselves to any particular type of machine gun, although the single-barreled Maxim with vertical shields predominated.

The Japanese machine gun, which was of home manufacture, followed the Hotchkiss type. It had the tripod mount for fortress and the wheeled mount with shields for mobile service. Its mechanism was actuated by gas pressure and not by the force of recoil, as in the Maxim. It fired infantry ammunition at the maximum rate of 600 rounds a minute, but the maximum amount fired per gun per day in the First Cavalry Brigade (General Akiyama) was but 4,000 rounds. The cartridges were mounted on strips of sheet brass.

Tactically, the Japanese machine guns were used chiefly for defense. Great importance was given to concealment, and it has been claimed that not a single machine gun was put out of action by Russian field artillery.

Machine guns were popular with the Japanese army, and gave good results in spite of the fact that they could shoot in but one direction, straight to the front, and that many of them became disabled through the breaking down of their delicate mechanism.



THE EFFICIENCY OF THE MAXIM MACHINE GUN.

Extract from *Das Maxim-Maschinengewehr*,^a by Captain Braun.

Translated from the German for the Second Division, General Staff, U. S. Army, by
Capt. DAN T. MOORE, Artillery Corps.

As the gun is of the same caliber as the infantry rifle and uses the same ammunition, it is evident that its ballistic efficiency will be very nearly the same.

The Maxim machine gun can be made for use with any desired infantry ammunition.

Notwithstanding that a machine gun can fire from 400 to 700 shots per minute, the swinging motion of the barrel, and consequent shaking up of the carriage, does not seem to have any effect whatsoever on the trajectories of the different shots. The targets pictured in this pamphlet demonstrate this very clearly.

A ballistic expert, Col. V. Scheve, expresses himself as follows in the *Kriegstechnischen Zeitschrift* on the efficiency of the Maxim machine gun:

"The ballistic qualities of the arm, as far as muzzle velocity or steadiness of the trajectories are concerned, do not differ materially from those of other small-caliber arms. When firing at a rate of 600 shots per minute (10 per second), considering that a person has to count very quickly to count up to 5 or 6 in one second, the question is very rightly asked if the swinging motion of the barrel under such conditions would not so affect the line of departure of the different projectiles as to materially diminish the number of hits which might otherwise be expected. The targets show that the results obtained with rapid fire and when using the gun with single shots are different, and also that the difference is very slight. At small ranges the difference is too slight to be considered, and at long ranges actual experiments have shown

^a*Das Maxim-Maschinengewehr und Seine Verwendung*, by Hauptmann Braun; (R. Eisenschmidt, Berlin, 1903.)

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that other conditions tend to scatter the bullets so much more, that the actual number of hits obtained is often much greater than could be obtained by using a number of rifles."

Lieut. Gen. D. Rohne gives the same favorable opinion in his book, *Das Gefechtsmäßige Schiessen der Infanterie und Feldartillerie* (Battle Firing of Infantry and Field Artillery), and also in an article in the *Jahrbücher für die Deutsche Armee und Marine*:

Efficiency of the Maxim machine guns of different calibers.

Caliber.....	{ 7.9 mm. 0.311 inch.	7.65 mm. 0.308 inch.	7 mm. 0.273 inch.	6.5 mm. 0.253 inch.
Muzzle velocity.....	{ 645 m. 2,121 f. s.	652 m. 2,136 f. s.	710 m. 2,325 f. s.	730 m. 2,394 f. s.
Velocity at 25 meters.....	{ 620 m. 2,032 ft.	630 m. 2,064 ft.	685 m. 2,247 ft.	700 m. 2,295 ft.
Muzzle energy meter-kilogram....	312	303.6	287.9	273.2
Greatest range.....	{ Nearly 4,000 m. 13,050 ft.	4,000 m. 13,050 ft.	Over 4,000 m. 13,050 ft.	Over 4,000 m. 13,050 ft.
Elevation.....	32°	31°		
Maximum pressure in bore, kilo-grams per square cm.....	3,200	3,000	3,500	Nearly 4,000

Mean penetration of 8 mm. jacketed bullet:

Sand and earth:	Penetration.
Range 100 meters.....	Meter.. 0.9
Range 800 meters.....	do... 0.35
Seasoned pine:	
Range 100 meters.....	do... 0.80
Range 800 meters.....	do... 0.25

If we assume that one man armed with the infantry rifle can hit the target 10 times in one minute, we can say that our machine gun is as efficient as 50 or 60 men on the firing line, besides which the gun and carriage offers only a small target and is easier to aim than the infantry rifle, as it offers a steadier platform, and owing to the sweeping effect it is easy to change the range, as up to and including 1,500 meters the bullets fall very close to one another. This is very important when operating against field artillery.

SUPPLYING AMMUNITION FOR THE MAXIM MACHINE GUN.

The ammunition supply for the Maxim machine gun is very simple and effective. It is obtained by means of belts holding from 250 to 450 cartridges, packed in boxes which are easy to transport. The belt is taken from the ammunition boxes by hand and is inserted in the feed-block, leaving the gun on the left side. These belts, being formed of two pieces of webbing, can not be damaged by being stepped on or being bent as metal ones can. Their weight is very small, and they are protected against the weather by waterproofing, which also protects them from dampness. Empty belts can be filled in a very few minutes by means of a special loading apparatus. Wasting of ammunition is prevented by the machine gun, as its fire can be concentrated on any desired point, with much less wasting of ammunition than could be obtained by infantry fire.

With volley firing by infantry the shots are too scattered, whereas with the machine gun, owing to its sweeping effect, it is always easy to get the range, as the point of fall of such a number of bullets can always be observed in the water and nearly always on land.

Naturally a large supply of ammunition is needed. Otherwise the supply will soon be exhausted; but, on the other hand, a machine gun does not require as much ammunition as an infantry company of 150 men. Different methods of carrying the ammunition have been devised. In a mountainous country a man can carry quite a number of rounds in his knapsack. Eight packages, containing in all 2,000 rounds, can be packed on a horse and carried over any ground in any country. The ammunition wagons designed to accompany the gun when operating with cavalry or mounted infantry, carry enough ammunition to supply the gun during any fight, besides which it also carries the gun and one man to operate it. Ammunition wagons to accompany the ammunition train can also be had in different forms, each one capable of carrying 12,000 rounds, packed in boxes, and a necessary number of tools or spare parts.

**HISTORICAL SKETCH OF THE USE OF THE MAXIM
MACHINE GUN IN WAR.**

In order to make proper deductions for the tactical use of machine guns in war, it is necessary to consider the use they have been put to in recent campaigns. Up to date the actual experiments that we have had with the gun are open to many objections, as in general they have taken place outside of Europe, most cases reported being in fights against savages. These experiments are not without value for the tactician, we Germans, for instance, having learned from observation of the South African war that our method of advancing the firing-line company or battalion was useless when opposed to an enemy who could shoot and was armed with a small-caliber rifle.

The Maxim gun was first used in the numerous colonial campaigns of Great Britain. In 1882 a battery of machine guns at Tel-el-Kebir silenced the fire of the enemy's forts in a very few minutes. The Egyptians were routed, and the English troops found the entrenchments full of dead bodies. In the campaign of 1893-94 against the Matabeles (northern Transvaal) a detachment of 50 infantrymen with 4 Maxim machine guns defended themselves against 5,000 warriors, who charged them five times in an hour and a half. All of these charges were conducted with great bravery and were invariably stopped at about 100 paces in front of the English firing lines by the destructive fire of the Maxim guns. The enemy left 3,000 dead in front of the English position.

In the Chitral campaign in 1895 on the Afghan frontier, when attacked by the fanatical mountaineers of the Hindu-kush, a few machine guns saved the day for the English. The storming of the Malakan Pass was only made possible by the rapid fire of the machine guns, which were carried by mules to the top of a cliff overlooking the pass. From this position fire was opened on the enemy's flanks at a range of about 1,400 m., the enemy having taken position behind a wall. This fire was so effective that the native Indian troops who charged the position were only opposed by the dead bodies of the enemy. In some of the fights in the 1898 campaign in the Soudan these guns were extremely successful, and it is stated that General Kitchener could not have held out against the

heroic bravery of the dervishes if he had not had them. We will only describe two of the fights of the campaign—namely, the battles of Atbara and Omdurman. At first each English infantry regiment was given 2 machine guns. This was changed in February, 1898, a Maxim battery of 6 guns being formed, the command of which was given to Major Hunter. A company pack wagon drawn by 3 mules in tandem carried each gun and 5,000 rounds of ammunition. The reserve ammunition, 20,000 rounds, all followed the battery, packed on mules or camels.

At Atbara as soon as the English infantry had formed against the dervishes the Maxim battery proceeded to the flanks, so as not to disturb their fire and at the same time to attack the enemy's flank. The two leading mules were unhitched, the wagon being drawn to its position by the remaining mule. When the dervishes had advanced to within 1,800 m. of the English position, fire was opened with the machine guns and was kept up with great effect and without accident to the gun till the end of the fight. According to Major Hunter, the following method of finding the range was used: Each gun fired with its own line of sight, the point of fall of the bullets being observed, (an easy matter on the sandy soil,) and, the elevation being changed until the desired range was obtained, fire was then opened with the next range above.

Of course it is easier to observe the points of fall of the bullets in the clear air of the Soudan than it would be on a European target range, and the fact must also be considered that the attacking dervishes, to whom the Khedive had promised entrance to Paradise if they were killed on the field of battle, disdained all cover. Seven months later at Omdurman, we find the same organization of the machine guns—namely, divided into batteries of 6 guns each—and they contributed as much toward the victory of the English as they did at Atbara. In this case the guns took a frontal position against the great body of attacking cavalry, the battle commander using the method of aiming described. The method used at Atbara would have required too much time when operating against attacking cavalry. Fire was opened at a shorter range than necessary, and then without changing the rear sight the elevation of the gun was gradually increased until the desired range was obtained. In the last period of

the attack the battery commander resorted to platoon firing, the second platoon using a range differing by 400 yards, and the third a range differing by 800 yards from that used by the first platoon. By this method great effect was obtained during the last few moments of the attack and during the first few moments of the flight of the dervishes. This offers a good example of the powerful effect of the machine gun when operating against the charge of a powerful cavalry attack. Not less than 20,000 dervishes were slaughtered at Omdurman.

During the Transvaal war both sides used the Maxim machine guns in all sorts of positions and mounted on all sorts of carriages; and, taking it all in all, they confirmed the reputation that they had made for themselves in the previous colonial wars of England in Asia and Africa, and also the reputation that the Gatling machine gun had made for itself in Cuba with the Americans. Against all expectation, the use of the Maxim gun did not prove as effective as was expected on the English side. This can be explained, first, by the method of fighting used by the Boers, and, secondly, by the fact that notwithstanding the success that had been obtained by the organization of machine-gun batteries in previous colonial campaigns in the Boer war the machine gun generally acted independently and without any directing spirit, in most cases entering a fight without even being attached to the infantry and without any support.

As soon as they were permanently attached to divisions of cavalry or mounted infantry their efficiency improved rapidly. In the first part of the campaign the Boers employed the Maxim guns with much greater effect than did the English. They generally occupied a position on the flank or at the key points of the defensive position and were very seldom placed in advanced positions. As a rule they were most carefully hidden from sight either with artificial means or by the natural lay of the ground and were especially effective at the battles of Ladysmith, Glencoe, and Modder River in repulsing the infantry attack. They were quite as effectively used by the Boers after the dispersion of their forces by being attached to the mounted detachments which operated against the flank and rear of the English columns.

We must not overlook the 3.7-cm. Maxim machine gun. The English, according to their own statements, learned by

bitter experience that they did not have enough of these guns, and after the opening of hostilities shipped great numbers of them to Africa. They were used in the same way as the small-caliber machine guns. The Boers, who were better prepared than the English, had a number of these 3.7-cm. machine guns (called "pompom" because of the noise they make). They were generally used against edges of woods or high ground where the English detachments were supposed to be operating. The great number of striking projectile (1-pounder), combined with the noise of the gun and of the exploding shells, generally accomplished the desired result. In the Chinese troubles Maxim machine guns, both of large and small caliber, were used by the Russians and Germans in the land operations. The few that were landed by the allies were not used at all, returning with Seymour's column.

The Russian gunboat *Giljak*, according to a report published in the *Marine Rundschau*, used the Maxim guns in its fighting tops with the greatest effect. As soon as their fire was directed against the enemy, the latter's cannoneers were obliged to seek shelter and stop serving their guns. The greatest range was 15 cables (1 Russian cable equals 138 meters).

The part taken in the naval attack against the Taku forts by the German warship *Ilitis*, the report of which was given out by the Navy Department and published in the October number of the *Marine Rundschau*, contains the following interesting statements regarding the efficiency of automatic arms, and especially of the 3.7-centimeter machine guns:

"The remarkable effectiveness of the machine guns on the *Ilitis* was demonstrated by the fact that the Chinese cannoneers were unable to stay at their posts, being obliged to seek cover one or two minutes after fire had opened on them with these guns. As soon as the fire of these guns was directed on other points the Chinese again manned their guns."

The photographs^a printed in the pamphlet by permission of the Navy Department, which were taken before the Maxim automatic guns were repaired, show conclusively that the fire from the Chinese forts was well directed, and also that the automatic guns on the upper deck were exposed to a perfect hail of projectiles.

^a Not reproduced.—EDITOR.

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According to the report of the commanding officer of H. M. gunboat *Itis*, most of the damage to the guns was caused by pieces of exploded shells and splinters. Some of the damage was also done by good square hits. This was the case with one of the 3.7 machine guns, the pivot of which was hit by a shell the caliber of which was at least 15 centimeters. It is possible that this shot was fired from one of the 17-centimeter R. F. guns (40 caliber) located in one of the southern forts. This shell, which killed No. 1 cannoneer, exploded several meters farther on upon hitting the deck. The machine gun, which had been damaged several times previously, but not enough to affect its efficiency, upon being hit by this shell fell over on its side and could not be used any more. A photograph of an 8-millimeter Maxim machine gun that was put out of action by the fragments of a shell is also shown.

THE RELIABLE WORKING OF THE MAXIM MACHINE GUN.

From the *Kriegstechnische Zeitschrift*, Part 4, 1905.

Translated for the Second Division, General Staff, U. S. Army, by Capt. FREDRIK L. KNUDSEN, Eighth Infantry.

Among the numerous systems of machine guns which come into consideration for use both in field and fortress warfare and which have also shown themselves indispensable to the armament of warships, the Maxim system occupies undoubtedly the first place. This machine weapon has been adopted in Germany, Russia, England, and Switzerland, and extensive experiments have also been carried on with it in Austria and Hungary.

The *Kriegstechnische Zeitschrift* has already discussed in its issues for 1898, for the first time in a German military magazine, the particulars of the construction of the Maxim machine gun and pointed out its power and applicability, and it has also continued to make it its business to give information concerning this weapon. May it therefore be permitted to call to mind something concerning the construction of the machine gun?

The use of the recoil when firing for the active working of the loading mechanism is the basic principle of the construction of any machine gun. The breechblock separates from the barrel so that an opening can be obtained to extract the shell used and insert a new cartridge. "The separation of bore and breechblock," says Maxim, "is, however, not to begin when the recoil commences, but it is to begin right after the projectile has left the barrel. Otherwise the shell would, during the time the projectile travels forward in the bore, be drawn to the rear out of the barrel with the breechblock, and entering into the space between the barrel and the breechblock would here constitute the only gas check. An especially strong shell would be required for this purpose. Even such a one might perhaps crack occasionally and cause a rush-

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ing out of the gas to the rear. It will in any case be safer to keep the breechblock locked as long as the projectile is in the bore."

Maxim has therefore found it expedient to arrange it so that the barrel and the breech slide together to the rear in firing as long as the projectile is in the bore, and immediately after that the breech travels on alone. Now, if a suitable spring is compressed by the barrel and breech traveling to the rear, it can be utilized to return breech and barrel to the firing position after reloading.

The principle of the mechanism may be briefly described as follows: The barrel, with the breechblock, which latter consists of a bent hinged lever deflected downward, runs back about $2\frac{1}{2}$ centimeters as a result of the recoil. By striking against a lug the lever is pressed downward, whereby the breechblock glides back the length of a cartridge. A spiral spring, compressed by the recoil, forces the breechblock to the front again. The trigger is cocked during the movement to the front and rear. Then the ejection of the fired shell and the insertion of a new cartridge are performed. The firing is effected by pressing on a button, whereby the sear is drawn back by means of a sear-catch. The firing continues as long as pressure is applied to the button. The barrel is cooled by means of a water-jacket. The ordinary infantry cartridges are fired, which are placed—as a rule, 250—in thimbles on belts. The rapidity of fire amounts to 600 shots a minute. The machine gun weighs 26 kilograms.

The carriage differs according to the purpose. As an "infantry cart" the gun is on a two-wheeled wagon, which can be drawn by one horse on the march and moved, when in position, from one point to another by one man in the manner of a push-cart. In this case the shafts serve as handles. An iron plate, serving as axletree bolster and on which rests the gun proper, is placed between the two wheels. To the right and left of this are placed the cartridge-boxes. At the front end of the axletree bolster, cut out corresponding to the croup of the horse, is an iron hook, which is hooked into the singletree. For keeping the cart upright are placed, underneath on each shaft close to the axletree bolster, poles which are connected by a cross-bar; these poles are fastened up during traveling.

As "galloping carriage" they use a limber-like two-wheeled arrangement, which contains, besides the gun, the seat for the cannoneer. The latter sits, during the firing, on the splinter-bar with his back to the two horses to which the carriage is harnessed. There is no shaft on this peculiar vehicle; the horses merely run between the two traces.

In the case of the "tripod carriage," which is provided with removable wheels, the cannoneer sits on a kind of a bicycle saddle, which slides on the leg away from the enemy. For traveling, both the short front legs of the tripod are folded on that having the seat, and one man pushes the gun against a handle into the prescribed position. According as the legs are placed nearer together or farther apart, the firing position can be raised or lowered.

The machine guns and their tripods can also be transported on pack horses. In this case the gun is, as a rule, on the right side, while the folded tripod is placed lying flat on the pack saddle. The ammunition boxes are on top of the pack saddle.

The weight of the Maxim gun is so small that it can also be carried by one man. A so-called "pannier carriage" was constructed, especially for Switzerland, on the principle of the pannier used in the mountains for carrying loads on the back. In this case the load has, on the one hand, its point of support on the shoulders of the man and, on the other, on the ammunition box, made on the principle of our old cartridge boxes. The man thus loaded down carries, besides a bayonet, only an alpenstock for overcoming difficult steep places. When the Maxim gun, with the pannier carriage, is in the firing position, the upper part of the pannier, made so that it can be folded, forms the front support of the gun.

Finally may be mentioned a "breastwork carriage" which is made especially for earth breastworks, capable of being raised, so as to elevate it to the increased height of the firing position. For this purpose the handle of a cogged pole, serving as a shaft, is laid on the crest of the breastwork, and the gun, with both wheels on which it is transported, is elevated by means of a crank. Thus a kind of a disappearing carriage has been produced which makes it possible to change position entirely out of sight of the enemy.

Mounted on the different kinds of carriages described here the machine gun will be able to meet the demands of the most varied situations in war, whether it be in field warfare, where it will for the most part be on the infantry cart or the galloping carriage, or in position or mountain warfare, where it can be put on the other kind of carriages. It should also be mentioned here that the machine gun of the German army is put on the carriage by means of a sled, which can be taken off and, if necessary, pushed or dragged by the men.

In connection with this brief data is to be pointed out that in the article appearing in the January issue, 1905, of this magazine, "The Question of the Distribution and Use of Machine Guns"^a by Layriz, lieutenant-colonel, unattached, the construction of the machine guns in use is found fault with. Thus is quoted on page 27, paragraph 4:

"The machine gun has still to overcome successfully some 'childish complaints' of its technical development."

And, further, in the following paragraph:

"The keeping together of the machine guns in groups, which has been decided on in Germany, is best suited to the present condition of incompleteness."

The Maxim machine gun, adopted for the German army and, as mentioned in the beginning, introduced in many other States, is according to this especially designated as incomplete, so that the question arises whether this assertion is justified.

If the philosophical standpoint is taken that all things made by human hands are capable of improvement, of greater perfection, this also applies to machine guns and this verdict must be accepted. But it is another matter to designate as incomplete a weapon which, like the Maxim machine gun, has been procured in considerable numbers by the German and many other army administrations, and has on many occasions given proof of its value as a military weapon, because an exception is not made for this weapon in the extract cited, but it has been judged with machine guns in general. We exclude in this case the use of the machine gun in the last century, where it played a decisive rôle, especially in the actions against the Mahdists, and limit ourselves to a

^aThis essay will be found on page 131.—Editor.

consideration of the experiences which our own troops have acquired by using the Maxim machine gun.

In the actions at Waterberg,^a in 1904, the detachments of Müller (von Mühlenfels) and von Estorff were armed with 6 and 4 machine guns, respectively. They found frequent employment in the heavy actions and performed their task of repulsing the assaults of the Hereros and driving them out of their positions. In this case there occurred only once a delay in the working of the machine gun, and this was caused by the swelling of the barrel. This can often be caused by a too great heating of the barrel, and the cause for the occurrence might have been in the lack of cooling water—an assumption that is logical and certainly applicable to the conditions of the southwest African war. But in this case it was also brought about by especially unfavorable conditions, the gun barrel was changed in about thirty seconds by a gun commander under the most intense hostile fire, and the machine gun was able to sweep away at the proper time the Hereros that had already reached the closest ranges.

Captain Franke, who has returned from southwest Africa and who has had for months an opportunity to observe the use of the machine gun under the most different conditions in action, has expressed himself further concerning this to an employee of the *German Beacon* in the following way:

“Different things have indeed been said many times in the military world of the value of the machine gun. To us in southwest Africa it was of conspicuous value as soon as we succeeded in bringing it on the skirmish line and directing it on a not too distant object. Its good qualities showed themselves especially when the enemy was in the jungle; then the machine guns were far better to use than field or mountain guns, since the many single projectiles penetrated well.”

The Maxim machine guns are, according to this, well judged by the experienced officer mentioned; a complaint of its uncertain working has not been uttered, and, finally, the Prussian-war minister, Lieutenant-General von Einem, declared at the session of the German Reichstag on December 14, 1904, that the machine guns stood the test excellently in southwest Africa.

^aGerman Southwest Africa.—Translator.

The foregoing statements might suffice to show that the Maxim machine guns are weapons thoroughly suited for war purposes and that it is unjustifiable to designate them as incomplete.

According to the deductions of Lieutenant-Colonel Layriz at the close of his article, this officer seems to seek the perfection to be striven for especially in so simplifying and lightening the weapon that it can be carried and handled by one man. Such a construction does, as known, exist already; but whether it comes up to the Maxim machine guns as regards solidity of the cones of projectiles, rapid ranging, and the possibility to keep up a longer lasting fire is an open question. We must not only doubt this, but emphasize quite particularly that one of the great advantages of the Maxim machine gun exists in the great variety of its mountings, whereby its use by both infantry and cavalry on every kind of ground and under every imaginable condition is guaranteed, which, so far as we know, is not even approximately the case with any other system of machine guns.

MACHINE GUNS: THEIR TACTICAL USE AND VALUE FOR THE DUTCH ARMY.

By Captain J. H. VAN DER HEGGE ZIJNEN, Jäger Regiment.

From *De Militaire Spectator* for January, 1904.

Translated from the Dutch (Holland) for the Second Division, General Staff, U. S. Army, by JAMES OSSEWAARDE, Chaplain Twenty-first Infantry.

Technical knowledge subserves the interests of all things and all men. The great changes which it has brought about in course of time in the weapons of warfare wherewith armies have been equipped, have resulted in the exercise of greater destructive power, and this, in turn, has determined the course which tactics was obliged to assume with a view toward reducing, as far as possible, through the introduction of new methods of warfare, the losses liable to be sustained through exposure to the enemy's fire. The urgency for the introduction of weapons of greater power was continually and irresistibly felt, and every improvement which technical knowledge made possible was eagerly turned to advantage. Consequently we find that, at the close of the Crimean war, the smooth-bore guns of the infantry were permanently discarded and turned into the storehouses, and that, during the period from 1856 to 1864, nearly all the larger powers and a few of the smaller, adopted rifles. Still in the year 1859 the French took the field, armed with the smooth-bore gun, against the Austrians who had been equipped that same year with the rifle. Inferior thus, in this particular, Napoleon's troops could overcome the disadvantage through the fire of their rifled muzzle-loaders (with which their artillery was partially equipped) as against the smooth-bore cannons of the Austrians, and as a result we notice that Austria, after the war, increased the efficiency of her army by availing herself of the advantages of the rifled cannon.

As regards the artillery, there also was a period when it proved to be defective—when the smooth-bore cannon was unable to cope with the breech-loading rifle, whose long range had greatly increased the defensive power of the artillery. These rifles kept the batteries at such a distance that their fire either failed to reach the column formations or failed to produce any appreciable results. (See Kühne: *Kritische und unkritische Wanderungen über die Gefechtsfelder der Preussischen Armeen in Böhmen 1866*, 5th vol., Supplement, p. 220.)

And in the *Jubiläumsband* of *Von Löbell's Jahresberichte*, volume 2, page 630, it is mentioned as an additional cause of the artillery fiasco of 1866 that the inferior handling of the Prussian artillery was due, in part, to the mistaken and exaggerated ideas prevailing in the country in regard to the value of rifled cannon, and, furthermore, to the adoption of the weapon in the *marschcolonnes* provided with *reserve artillerie*.

“Not the least cause for the inferior place of the Prussian artillery was the extraordinary excellency in armament, equipment, and tactics of the Prussian infantry as compared with the Austrian infantry, which made it possible for the Prussian infantry, after a short skirmish, to begin battle without awaiting assistance from the artillery. From the very beginning the Prussian infantry demonstrated their superiority in armament and equipment, even though they did not excel in numbers. The longer the campaign lasted the more self-reliant did the Prussian infantry become and the less did they feel the necessity of awaiting assistance from the artillery.”

A Von Hindersinn and a Von Hohenlohe, the late gifted author of the *Militaire Brieven*, were the first to give this branch of the service their support and assign it to its lawful place, so that the years 1870–71 may be regarded as marked years in the military history of Germany, while only four years previous to this time the Prussians had sent one-third of their artillery into the field with smooth-bore cannons.

The infantry again took a stride forward. Repeating rifles, smokeless powder, the decrease of the caliber with all its accessories, rendered her a most dangerous antagonist. When, however, fixed ammunition proved successful with the artillery, when the powder bag was superseded by the metal

shell fastened to the projectile, when percussion and time fuses were combined, when the loading was thus greatly simplified and the rapidity of firing increased also through the subtle manner of diminishing the recoil by the application of the hydraulic brake, when the terrifying and dangerous high explosives had become more subdued, then there appeared the rapid-firing gun, which now has been, or is being, introduced everywhere and which not even the smaller nations can continue to ignore, mindful of Napoleon's maxim: "On the battlefield the victory is conditioned three-fourths by moral and one-fourth by material influences."

The competition between Krupp, Ehrhardt, Schneider-Canet, and still others has resulted in making the new field gun, with or without protective shields, a weapon formidable in rapid firing, formidable in mobility, and because of its slight elevation above the ground an enemy difficult to locate. Thus the artillery had again reached a stage where it could confidently assume the aggressive, and it now remained to be seen how the infantry would cope with an antagonist who by means of howitzer as well as cannon was able to locate and strike the enemy behind their defenses.

To restore the equilibrium, recourse was had to the weapons which had been satisfactory as far as their range and firing rapidity were concerned, but which failed to answer the expectation solely because too much was expected and required of them. The revolving rapid-firing gun, the *mitrailleuse* brought into action on the side of the infantry, had to increase the infantry's defensive power and assure it of an increase of strength, so as to make it less dependent in the face of the modern infantry fire. For the Gatling had found a field in the American civil war and given good satisfaction in the navy, and the *mitrailleuse* or the *canon à balles* had been used in the French field artillery in the year 1870-71.

The *mitrailleuse* had awakened great expectations, but caused even greater disappointment. Secretly constructed at Meudon, it became evident in the field that it had a range of only 1,800 M., that it was extremely difficult to regulate the firing, and that, used against the infantry at an appropriate distance "produisaient des effets meurtriers," but that it was put out of commission very easily by the artillery. However, its moral effect was very great. Commandant Rousset

writes on page 64 of his highly-honored treatise: "Celui-ci aimait à en entendre le crépitement significatif, et il est arrivé souvent que quand une troupe décimée commençait à faiblir, il a suffi pour la maintenir en bon ordre de faire avancer une batterie de canons à balles qui aussitôt, coûte que coûte, ouvrait son feu sur n'importe quoi." "He (the soldier) loved to hear its significant rattling, and it often happened that, when a decimated battalion commenced to weaken, it was sufficient for the purpose of maintaining order to advance a battery of mitrailleuses, which at any cost opened fire at anything in sight." Now, this may appear to be a meager positive result, still it indicated that a small rapid-firing gun, rightly used, could produce great results, and rightly does Hauptmann Braun observe in his treatise: "Das Maxim Maschinengewehr und seine Verwendung" that poor results are due to improper use and ignorance of the peculiar qualities of the weapon.

Hauptmann Braun's treatise is used considerably in this discussion, and mention is made of this to forego a charge of plagiarism, although it must be admitted that there is very little in this world that can lay claim to originality. The six illustrations are photographs^a taken from this treatise.

In the meantime the way had been pointed out by Gatling, and constructors of note such as Maxim, Hotchkiss, Cowell, Colt, Gardner, Madsen, Bergmann, Judge, Aartshertog Karl Salvator en Dormus, Nordenfeld, Gruson, and others started to work and furnished machine guns that were adopted in the navy and in the permanent fortifications, but which did not as yet appear suitable for the field.

These different constructions have their own peculiar advantages, and in making a choice from these gradually improved weapons, political as well as technical considerations frequently enter. Thus, for example, France chose the Hotchkiss model and not a German make, Austria adopted the model Karl Salvator-Dormus, and Germany improved the Maxim model, thus adopting an American invention, inasmuch as Hiram Maxim was one of the directors of the large firm, Vickers Sons and Maxim, in England. For some time this firm has granted the right to the German Waffen- und Munitions-Fabriken in Berlin to manufacture these weapons.

^a Not reproduced.—EDITOR.

Did the revolving cannons have more than one barrel, the principal feature of the present machine gun, which constitutes the subject of this discourse, is that it has one ordinary barrel with a special breech mechanism resting on a light carriage, with an arrangement for the prevention of superheating during the rapid firing, and, furthermore, that the direction of the fire, which is automatic in its action, can be changed with great facility and thus scattered over a large area.

The Maxim machine gun, which has been introduced into 19 armies and 21 navies and which is on trial by 13 other powers, may well be regarded as one of the most improved models.

Without a clear illustration a description would be incomplete, and hence attention is merely called to the fact that the barrel is like the ordinary barrel of any gun and that it is surrounded by a casing filled with water (3.7 kilograms) to prevent superheating during the rapid firing, with a provision made for the escape of the steam when the water is heated to the boiling point. There are those who disapprove of this arrangement for allowing the steam to escape, as it does away with the advantages derived from the use of smokeless powder. The Hotchkiss model, adopted in Belgium in 1900, has no casing for water, but still provision is made for the radiation of the heat, so as to prevent the heating of the barrel above 400 C., while in the Fitzgerald model (with eight barrels) the contrivance for keeping the barrels cool is a secret with the inventor.

Also the Colt model (see *Revue d'Artillerie*, July, 1902) is without a heat radiator, and, when tested, it was found that the oil used for oiling was burnt, and that after 7,000 shots had been fired the rifling was worn out.

By merely pressing a button the firing begins, and it continues as long as the pressure is continued. As soon as the pressure is relieved the firing ceases. By pressing the button at short, quick, intervals, single shots may be fired. The average rate of firing is from 400 to 500 shots per minute, corresponding to the number of cartridges to be fired under favorable circumstances in one minute by one section of infantry. As soon as the firing ceases, the water is removed from the casing and the barrel cleaned and oiled.

The Maxim is made very strong and consequently is very durable. The gun with breechblock weighs about 27.5 kilograms, is 1.07 meters in length and can thus be easily carried by one man. The mounts or carriages differ in form. Thus three-legged pedestals, similar to the tripod of the camera, are used. One of the legs, which is drawn backward, has a movable saddle on which the gunner takes his place, while different elevations 0.25 meter can be assumed. The tripod is furnished with wheels which may or may not be detached, so that the gun, the tripod, and the two wheels, constitute a light carriage.

In Germany the Maxim machine gun, adopted by the cavalry and infantry, rests on a sledge-shaped carriage of 51 kilograms with two small wheels. Two men can easily carry gun and carriage, or, thanks to the wheels, can pull it along on straps. It appeared from tests made that it could, even with little difficulty, be taken to the upper story of a house.

In marching order the gun with sledge is placed on a cart, which, fastened to the limber, constitutes a four-wheeled carriage, drawn by four horses in charge of two riders. In case of a sudden attack fire can be opened from the cart and hence, during the march, the machine gun is far less defenseless than the ordinary field gun.

The cartridge belts contain 250 cartridges each, weighing for the German gun, model 1898, 8 kilograms. These belts are contained in wooden boxes with drawing lid, and they unwind during the firing.

The Hotchkiss, which has been adopted by four armies and two navies and is on trial with seven other powers, is smaller than the Maxim and not as heavy. The gun itself weighs only 18 kilograms, and an adjustable tripod on which it is mounted, only 15 kilograms, while the newest construction is even lighter, weighing only 24 kilograms complete. It has been mentioned that this machine gun has no water casing and that the cooling takes place by means of a radiator, which is a great advantage, as in the field it is often as difficult to find water as it is to carry it along.

One horse carries the gun and tripod and 600 cartridges besides, while another horse carries 1,920 rounds. The rate of firing is 500 to 600 shots per minute, and is therefore greater than that of the Maxim, although the cartridges are fastened

to a copper band liable to indentation and not to a canvas belt.

The results of a trial in Sweden, which placed the Hotchkiss above the Maxim, are not irrelevant to this discussion. Some of these results are as follows: The gun consists of only twenty-nine simple yet solid parts; the mechanism is readily understood and easily kept in good condition; subordinate parts damaged by firing are easily replaced; defects which hinder the operation are quickly discerned; water for cooling the barrel is not necessary; and the annoyance caused by the formation of steam does not exist. The model is the least susceptible to moisture and dust. The torn cartridge shells do not affect the continuity of fire, which cannot be said of the Maxim. Of 20,000 shots fired, there was not a single torn cartridge shell, which in the Maxim frequently gave rise to undesirable, desultory, firing.

It was also on these grounds that the Swedish commission came to the conclusion that the Hotchkiss (6.50 milimeters) answered every purpose that could reasonably be expected from a serviceable weapon. The model is adopted in Belgium, also for the Congo State, in France, in Italy (navy), Mexico, Norway, Sweden (army), Portugal (navy), Russia (navy), and at last is also on trial in Turkey.

The Maxim is found in Abyssinia, in the Argentine Republic, Chili, China, Korea, Germany, Morocco, England, Persia, Peru, Russia, Switzerland, and Spain, and all these powers have adopted it for the army.

From this it appears that these two models have had the most extensive sale.

In view of the fact that the Maxim has been permanently adopted by our military leader and powerful neighbor (Germany) and has come into prominence at several maneuvers, we will consider this weapon more in detail and give a hurried sketch of its construction.

The Maxim has been permanently adopted for the troops in Germany, England, Mexico, and Switzerland; it is on trial in France, Russia, and Japan; Portugal expects to put it on trial this year, and Austria has begun to experiment with it. In America 50 pieces Vickers-Maxim have been issued to the infantry. (Mil. Woch., 1904, No. 2.)

Since October 1, 1902, Germany has incorporated 13 machine-gun detachments, mostly in the Jäger battalions and some in the infantry battalions; 12 belong with the Prussian and 1 with the Bavarian troops. In the future each army corps will receive a detachment. A detachment consists of 6 guns, forming three sections, with 3 caissons for the entire detachment. All carriages are drawn by 4 horses. For each gun 4 cannoneers and 1 gunner are required. The supply of cartridges is equal to about twice the amount issued to one company of infantry. The detachment commander has the rank of captain, lieutenants command sections, while the strength of the entire detachment is as follows: Four officers, 77 noncommissioned officers and privates, 55 horses, 6 guns, 7 carriages, of which 3 are caissons.

In the discussion of the drill and firing regulations reference will again be made to some of these matters.

Switzerland has 4 mounted and 3 unmounted Maxim-gun companies. The last named are assigned to the fortifications of the St. Gothard (2 companies) and of St. Maurice in the upper valley of the Rhone. The 4 mounted companies are assigned to the 4 army corps and placed under the direct supervision of the cavalry brigades. The company has 8 guns (4 sections), 4 double-team caissons, and 2 additional carriages—in all, 4 officers, 68 noncommissioned officers and privates, 99 horses, 8 guns, and 6 wagons. The men join the companies after they have passed through a course of instruction, lasting ninety days, at a school for recruits. The officers are detailed from the cavalry as well as from the infantry. The equipments consist of sabers, pistols, carbines (pistols 7.65 and carbines 7.5 millimeters). The company is also provided with 12 range-finders. Tactically, the company is divided into 2-gun batteries; 1 corporal and 5 troopers constitute the escort (Nos. 4 and 5 serving as horse holders). The caliber is the same as that of the infantry gun, namely, 7.5 millimeters. Gun and tripod are packed on one horse. Each horse carries 2 ammunition boxes, containing 2,000 rounds each. In all, 16,000 rounds are carried on pack horses, while the caissons carry 60,000 rounds.

England has with sorrow seen the advantages of machine guns, but has organized no separate detachments. The Boers did not use the machine guns in sections or detachments.

Sections have been incorporated with the infantry, the mounted infantry, and the cavalry, as far as the active army is concerned, and also with the Imperial Yeomanry and the militia battalions. They use the ammunition of 7.7 millimeters of the Lee-Enfield gun. A carriage on which the gun is placed is used by the cavalry, the yeomanry, and the mounted infantry. The barrel projects through a steel plate or shield which affords a protection for the marksman. The carriage for the infantry is lighter and is drawn by a horse or a mule in the care of a guide. In time of war every cavalry brigade is provided with one section and 41,000 rounds (for 2 guns). So also does each brigade and each militia battalion of the land service receive, in time of war, one section with 21,000 rounds. The protective shields used in South Africa furnished, in the main, an excellent protection against the Boer bullets.

Austria, as already stated, has undertaken to experiment. In the beginning of August, 1903, a cavalry and a mountain machine-gun detachment were organized with a view to putting the Maxim-Nordenfeldt to a practical test. From the *Militär Wochenblatt*, No. 113 of 1903, we notice that both detachments have each received 2 Maxim-Nordenfeldts, model 1889, and that the barrel is constructed for the infantry cartridge, model 1893.

The guns adopted by the cavalry have, as in Germany, a sledge-shaped carriage placed on a wagon, while all the attendants are mounted. The mountain detachment will not be considered at this time.

For each gun 11,000 cartridges are taken. These are contained in belts of 250 each. Besides the ball cartridge there are available the drill and blank cartridges of normal weight. The detachment is in command of a first lieutenant.

France is still experimenting. Since the year 1900 a few detachments have been organized with the "Chasseurs Alpins" but only, as it would seem, for mountain service. Hotchkiss is there *en vogue* and was adopted in the extensive cavalry maneuvers of 1903, held in the Argonnes.

Russia sent 8 machine-gun batteries on the Chinese expedition, each battery consisting of 4 guns. What they actually accomplished over there is not known. In Europe 4 companies with 8 mitrailleurs have been organized by way of trial, with each infantry division in the government at Warschau.

Japan, a military power in the Orient not to be despised, has 2 batteries on trial, the Maxim and the Gatling.

A year ago last May there appeared in Germany an outline of drill regulations for machine-gun detachments from which the following is gleaned.

From the introduction the following is quoted:

"Machine-gun detachments should, by their effective fire, increase the probability of victory. It is essential that they shoot accurately, from the right place, at the right moment, and at the right target."

Promptness in grasping the situation, good judgment in placing the piece, accuracy in calculating and measuring distances, skill in ascertaining quickly the range, must be constantly exercised, for all this is as essential to the successful operation of the machine gun as is the thorough knowledge of the requirements of other weapons in general but of the infantry in particular.

The detachment for the service of the gun is composed of 1 gun commander and 4 cannoneers of whom 1 is gunner. Dismounted, they are formed in single file behind the gun; mounted, 2 are seated on the limber and 2 on each side of the gun. The firing can take place either from the cart or from the sledge carriage, which, with the gun proper, can be detached from the cart and either drawn or carried to the chosen position. If detached, an ammunition sledge is placed within 2 paces of the gun. At the command "Load!" the belt containing the cartridges is pushed into the gun and the firing device cocked by means of a lever. After this the piece is pointed.

The two ways of firing are "Dauerfeuer" and "Reihenfeuer." The rapid automatic firing is "Dauerfeuer;" the last-mentioned kind, used to determine the correct aim, consists in firing 25 shots, after which there is a pause to consider the results, as the regulations state. Whether this will always be expedient is open to question. Depending upon the different elevations we distinguish between the standing, kneeling, lying, or sitting, firing position. It is to be observed further that the fire is concentrated upon one certain point of the target or scattered over its entire area. As a matter of course, the scattering diminishes the effect. As soon as the firing

ceases the command "Gewehr an Ort!" is given and the piece with sledge is taken up by two men and placed upon the cart.

The detachment of 6 guns with 3 caissons and 1 provision wagon constitute a fighting detachment. The combat train comprises the horses for the officers and the reserve horses, and the baggage train consists of a double-team pack wagon, a double-team provision wagon, and a forage wagon with 4 horses.

The extent of the front of the battery is 100 paces with 20 paces between the pieces, which can, however, be reduced to 5 paces in case of necessity.

Enough for our purpose has been gleaned from the drill regulations for machine-gun detachments, and we will further consider the substance of the firing regulations. What has been said in the infantry firing regulations in regard to the fire and power of the infantry gun is entirely applicable to the machine gun.

One hundred thousand ball cartridges are issued annually for each piece, of which some 60,000 are used for actual firing, 500 for practice by the officers, besides a number for trial firing, for target practice with carbines, etc. In addition to these ball cartridges there are available annually 100,000 blank cartridges, of which 70,000 must be used in field exercises and at maneuvers.

In speaking of the drill regulations it was stated what "Dauerfeuer" and what "Reihenfeuer" is.

From the firing table the following information is obtained:

Distance.	Size of target.			Percent- age of hits.
	Height.	Width.	Depth.	
	<i>Meters.</i>	<i>Meters.</i>	<i>Meters.</i>	
800 meters.....	0.56	0.43	16	50
1,600 meters.....	1.58	1.23	12	50
1,900 meters.....	2.45	1.65	12	50
2,000 meters.....	2.90	1.81	13	50

So much for the firing regulations.

General Rohne, the eminent expert in gunnery, has made the fire of machine guns the subject of an article in the *Militär Wochenblatt* of 1902, (Nos. 88, 90.) In this article the writer comes to the conclusion that the effect of these guns diminishes

very rapidly at the greater distances if the aim is not accurate. An accompanying statement indicates what percentage of hits may be expected in a broad target 1 meter high when the error in pointing amounts to 25 or 50 meters. With accurate aim we obtain at 500 meters 96 per cent of hits, and with an error of 50 meters in the pointing only 18 per cent; at 1,000 meters, 63 per cent if the aim is accurate and no percentage when there is an error of 50 meters. At 2,000 meters, 18 per cent with accurate aim and no percentage when an error of 50 meters is made.

The reason for this sudden decrease in the effect lies in the fact that the spreading is slight, and consequently the sheaf will be dense. The gun, to be sure, is not subject to the mistakes of the gunner (think of the jarring and the movement of the piece), which mistakes are increased with the number of gunners and which give rise to the increased scattering, thereby rendering a larger part of the field unsafe.

The great precision, a characteristic of the Maxim, will thus evince itself when the range is accurately determined. Where this is not the case, and where a comparatively insignificant error is made, the effect diminishes much more quickly than with a skirmish line, and remains below it. In his *Das Gefechts-mässige Abtheilungs-schiessen der Infanterie* and his *Schiess-lehre für Infanterie* on pages 8 and 82, respectively, General Rohne treats of this matter so important for the infantry as well as for the other branches of the service.

The density of the sheaf is also the reason that in using different ranges they do not usually allow a difference of over 50 meters between the ranges, for from tests made it appears that when the range is known an area of twelve times the number of meters of the distance of the range which is being used comes under fire, from which it again follows that at 1,000 meters two, at 1,500 meters three and four, and at 2,000 meters five different ranges should be used if the distance can not be accurately determined, and further, that under these circumstances, a detached section should not be allowed to fire farther than from 1,200 to 1,300 meters.

From the article just referred to, which contains a wealth of information, it is still further observed that a detachment of 6 pieces with 3,600 cartridges will, in one minute, scattering its fire at 800 meters, enable a detached battery to make 120

hits, which number decreases to 16 at 1,600 meters and to only 8 at 2,000 meters. And General Rohne maintains and estimates, further, that such a detachment of 6 pieces, as far as the effect of its scattered fire is concerned, up to 1,000 meters, has the same effect as a field battery of 6 pieces that has found its range, but that even then the Maxim detachment has this inestimable advantage that after one minute it has effect, while the field battery does not, until it has found the range, and still further that the Maxims consume an amount of ammunition which, expressed in kilograms, is equal to one-half of that of the battery. In his *Schiesslehre* the writer mentions that 100 skirmishers at 2,000 paces have to fire 101 (52) shots in order to effect, in 50 (26) minutes, 50 (30) per cent losses to an unprotected battery with 50 cannoneers. If the battery is half under cover, then it is necessary for these skirmishers to fire 200 (103) shots each to obtain the same results in 100 (51) minutes. This, when the range is not known. If, however, the range is determined, then it is necessary for each man to fire only 14 cartridges at the unprotected and 28 at the half protected battery to obtain the same results.

From these examples the accuracy of the fire of machine guns, within 1,000 meters plainly appears, and they point out the folly of using these machine guns at great distances. As a consequence, the theory that machine guns are able to take the place of the artillery falls to the ground. The greatest power is developed between 800 and 1,200 meters.



MACHINE GUNS IN THE ENGLISH ARMY.

Translated for the Second Division, General Staff, U. S. Army, from the *Militär Wochenblatt* (May 14, 1905,) by First Lieut. GEORGE J. ODEN, Squadron Adjutant, Tenth Cavalry.

The English army was the first, after the failure of the French *canon à balles* in the Franco-Prussian war to again use machine guns against an enemy. Their use in the colonial wars was given the less consideration in view of the fact that they were used against an enemy without artillery. The advantage of an automatic—that is, an arm requiring few men to serve it—is that it does away with a large number of men difficult to provide for, and more especially the baggage, particularly as to its weight. As to the circumstances incident to colonial wars we may repeat that when a machine gun is fired from a high carriage in order that the men serving the guns may obtain a good field of view that kind of machine is better adapted for defense than attack. Albeit in a decisive movement numerous effective destructive instruments have been employed, in England they still held to the single guns, as it was claimed advantageous that individual machine guns were more easily employed in the vicinity of the fighting line than a greater number would be. The English machine gun mounted on a higher carriage offers in this respect an easily recognizable target, so that in the Boer war all attempts to continue its use on the firing line failed. An English officer writes, and not erroneously: "It seemed to all outward appearances as though the commander and men always forgot that they did not have a gun, but a rifle, in their hands, and hence a weapon of limited power." While formerly a machine-gun train was assigned to each infantry brigade, it has been latterly decided in contrast with continental views, and differing from the opinions of individual war-experienced officers, to attach to the battalions first one and then two machine guns after the manner of former battalion guns.

The South African war showed that these battalions guns in many instances could not be employed, but were more often in rear of the line and of no service.

Attaching them to the cavalry regiments can not be advantageous, as its strong fire effect can only be turned to account as a support to the "fighting on foot." Only the commanders of the line as such and not the battalion commanders can know where the employment of machine guns can be made to advantage. The proposition to assign machine guns to the artillery was not carried out, in that it was rightly feared that problems would be assigned it that did not correspond to its proper functions.

To each infantry and militia battalion (that has been assigned to the field army) a train of machine guns has been assigned. To each battalion of mounted infantry and each cavalry regiment a train has been assigned, which consists of machine guns and pompoms. The latter is a machine-gun cannon of 3.7 centimeter caliber. Its introduction was the result of observations that pompom fire in a very high degree disquieted horses, though its material effect was very slight. "The pompom," General Viljoen writes, "makes a hellish noise when in operation, and it can work a demoralizing effect upon an enemy. But with this its virtue ends, for its results are nil. In absence of better pieces one must at least consider himself fortunate in the possession of several pompoms. With it we make noise in order to divert the watchfulness of the enemy."^a In the 1-pounder pompom we possess the best and most reliable range finder for the machine guns."

The infantry machine train is composed of 1 officer, 3 non-commissioned officers, 9 men, 6 horses, 2 machine guns, 1 cartridge, and one pack wagon. The gun is mounted on the highest carriage, and the men serving it are protected by a steel shield. The range is up to 2,300 meters. The gun weighs 27 kilograms; the carriage with a 1.2 wheel and 0.98 meter fire-height weighs 445 kilograms. The horse equipment consists of one horse or mule harnessed to shafts which is led by an unmounted man. The gun is only fired when the animal is unhitched. It then rests upon a perpendicular column, the upper

^a In the South African War.

part of which may be turned in order to fire toward the flanks. Four thousand cartridges in 16 boxes buckled to the carriage are carried with the gun. The cartridge wagon holds 13,200 rounds, so that there are 10,600 rounds available for the gun. The machine-gun train for a regiment of cavalry^a and presumably, too, for a battalion of mounted infantry, is composed of 1 officer, 22 men, 15 riding and pack horses, 1 six-span pompom, 1 two-span machine gun, 1 six-span pompom munition wagon, and 1 four-span machine gun cartridge wagon. The two-span carriage with pole (without gun) weighs 27 kilograms and ammunition 445 kilograms and with a wheel of 1.40 meters height, attains a fire-height of 1.52 meters, so that the revolving gun carriage enables it to be fired to the front and flanks. The range finder is protected by a steel shield. The fire may be delivered with horses hitched or unhitched thereto, but the former method has by reason of the vibration due to the horses breathing proved the least best. The manner of firing should for this reason only be employed in case of necessity. On the march a man may be seated on each side of the fore part of the gun carriage, one horse being harnessed in the shaft and the other, which carries the rider, alongside. On the carriage in the 14 boxes there are 3,500 loaded cartridges. The ammunition wagon carries 17,050 rounds.^b

Information concerning the machine cannon of the 3.7 centimeter caliber and with the 453 gram weight shell is still unobtainable. It is stated that the gun weighs 392 kilograms and the carriage, with 200 rounds ammunition, 416 kilograms. The fire delivery may be increased to a rapidity of 40 shots per minute. Presumably the gun carries 400 rounds ammunition. The range is up to 3,600 meters. Officers are armed with saber and automatic pistol. Noncommissioned officers with saber (infantry with short sword) and revolver. The men with rifles.

Our views for the tactical employment of these guns are (provided the guns are not held as a reserve by the commander, and their employment be independent of him when, in the opinion of the individual company commanders, they deem it practicable) various. While we count on sudden actions in

^a Supplement to the War Establishment, January 1, 1905.

^b With mounted infantry 17,600 rounds.

the nature of a surprise against lines of defense^a and the loss of individual guns on account of the possibility of clogging thereby impairing its service, we find the opposite to be the case in England. For their employment in attack the following points of view are given:

1. The machine gun should above all be employed at long distances; in open terrain it will seldom be possible to reach a position in the advanced line, where the gun furthermore offers too plain a target. Covered terrain is to be utilized in order to bring guns into action against the enemy. The advance of the infantry is efficaciously supported by machine guns at long ranges.

2. Delivery of general discharge against any one point of the enemy's position.

3. Defense against attacking cavalry.

4. Use of flanking positions.

5. Supporting infantry in detaining actions (while bringing up reinforcements and ammunition) although the effect upon low objectives is very limited.

6. Holding captured positions.

In defense, owing to the special functions of the machine guns, it will before all be of effect at the shorter ranges. In order to make this possible the guns must be especially protected against hostile artillery fire and it will always be advantageous to prepare various positions for their defense. The main problems will be:

1. To cover entanglements and command the terrain which is especially favorable for attack. Flanking of salient angles.

2. Reinforcing weaker positions.

3. Fire against advancing supports of the enemy.

The cavalry drill regulations in contrast to the infantry drill regulations appear to show that machine guns can be unitedly employed under command of division or brigade commanders. In general it is not recommended that fire be opened upon individual horsemen or smaller groups of the strength of a squad, in order not to betray the position prematurely. In battle the employment of machine guns in cooperation with dismounted troops may be practicable and to

^aIt is alleged that three of the best American Gatling guns were in action at San Juan, Cuba, 1898, and at a range of 550 meters from the Spanish trenches, drove them out in fifteen minutes with an expenditure of 20,000 cartridges and with a loss of 30 of their own strength.

protect a point of support for the movements or occupation or to protect a flank. Finally in an attack they support the fire of light artillery moving upon their outer wing in order to serve as a cover or to make a retreat easier. These official regulations do not fully cover the views held by the army. The chief instructor of the English School for Rifle Firing, Lieut. Col. Bird, spoke of the English Maxim gun in one of his lectures at Aldershot before the military society in the following words, in order to illustrate his view of its tactical employment: "It can develop a great fire effect upon a small space; it is easily concealed, though it has a tendency to become disabled; more than 1,000 rounds can not be fired continuously; finally but a small extent of the fire-commanded space can be reached. Trials in England have shown that at distances between 500 and 1,000 yards, a miscalculation of 100 yards reduced the fire effect one half" (in our opinion still too favorable). After exhaustive trials by the English 75 per cent of hits were made at—

Distance.	Number of hits with—	
	Machine guns.	Infantry-detachment fire.
500 yards.....	125	220
1,000 yards.....	70	120
1,500 yards.....	60	100
2,000 yards.....	75	160

Allowances for error in estimating distance for machine guns:

Distance.	Allowance for error.	Per cent.
	Yards.	
5,000 yards.....	60	12
1,000 yards.....	35	3.5
1,500 yards.....	30	2.3
2,000 yards.....	35	1.8

We see that at distances over 1000 yards (900 meters) where the influence of weather is very decided upon direction and distance, the admitted error in estimation of distance is less than the average error of the range finder. These give the geometric, and not the daily, distance, so that they have only a

qualified value in firing over 1000 meters. The English School for Rifle Firing may rightly contend that only under favorable circumstances is the machine gun suitable for the employment of long-range fire as required by the regulations. A distribution in the direction of depth was not provided for in the regulations, and the use of the various ranges is without results.

The fire effect of 60 machine guns simultaneously was determined at the Hythe at a distance of 500 yards for five consecutive minutes—probably the limit of time in which continuous fire is possible. In battle firing, however, these proportions sank from 25 to 35 guns. But we must consider that the moral influence at a peace firing could not be manifest; that from the opposite side a single favorable shot could put a machine gun out of the fight for a long time, while those pieces still continued to fire.

Just these circumstances, the lecturer declared (to whom we must credit the views of the English School for Rifle Firing), determine the employment of single guns or the combining of several guns for united action. The effect of single guns is so limited that it need hardly be considered. First, the employment of several guns together overcomes the disadvantages of this gun—*i. e.*, probable disablement, commanding ground of limited extent to the flanks. In contrast to the official regulations Lieutenant-Colonel Bird calls for the example of the Germans, who combine the 8 machine guns of an infantry brigade into a rapidly-mobile fire reserve under control of the leaders. At greater distances they should fire upon favorable targets and after attaining their objective retain their fire and cover the advance or retirement of the infantry; at effective ranges take certain points of the enemy's line under fire, in the pursuit to operate against the flanks; in defense to post them in pairs, flank salient angles, and make the approach to obstacles more difficult. It is entirely out of the rôle of the machine gun to conduct a long-continued fight against well-protected troops, and for their employment in detaining actions they are certainly not suited.

Thus in England, too, contrary to formerly-expected sanguinary results, the conviction has found expression that machine guns are only a weapon of convenience which must be used in their particular sphere before conspicuous results can be attained.

MACHINE GUN DETACHMENTS.

(*Allgemeine Zeitung.*)

Translated for the Second Division, General Staff, from the *International Revue* (March, 1905) by Capt. F. L. PALMER, Ninth Infantry.

On the battlefields of Manchuria the machine gun, the youngest of the special arms in modern armies, is in the way to prove its right to existence in the great pitched battle, and it seems to have undergone the experience successfully. The circumstances had been different where the machine gun had appeared before now—in the South African war and numerous other colonial wars. Small wars offered it at the first, chances of success essentially better than is the case in its employment in large armies.

The Russians and the Japanese, it appears, have used the new arm with success. Often the machine guns have been captured by one or the other party in serious engagements. They have then been employed in defensive positions and also in the offensive lines, as appears from certain reports. It is not at all incredible that a Russian battalion has been almost exterminated by the fire of machine guns, as has been said to be the case. In the first experiments with battle firing of the first German machine-gun detachments, which had been formed for experimental purposes in 1899, in the Tenth Battalion of Hanoverian Chasseurs, a result of about 80 per cent at a distance of 800 meters was obtained after a very short time against targets representing a section.

It may well be imagined that troops in campaign may arrive in the efficacious zone of the machine gun without finding cover and that they then undergo similar losses. The individual arm can fire up to 600 shots per minute, and its mechanism permits its being used in the manner of a spray. The firer, lying on the ground behind the machine gun, which rests on a kind of truck, can constantly see the target. He

can then keep under his aimed and uninterrupted fire a definite zone of the terrain upon which are the hostile skirmishers or columns. It thus becomes a question of a machine gun (*mitrailleuse*) and not of a rapid-fire cannon of small caliber. The ammunition is exactly the same as that for the infantry rifles, so that a machine-gun detachment having exhausted its ammunition can be resupplied by an infantry detachment, and vice versa.

The efficacy of fire of the machine gun is then comparable to that of infantry; yet its tactical employment is related in many ways to that of artillery.

The machine gun, which the men attached to it drag or carry on its mount to the position for firing, is transported during the march on a sort of carriage which also serves to convey the ammunition. This carriage is attached to a regular caisson-limber, which also carries ammunition. Besides, the detachment is also provided with a certain number of special ammunition caissons, so that each of the 6 machine guns of a detachment has at its disposal 11,000 cartridges. The machine gun, with its mount, is put into grooves on the upper part of the carriage. The detachment is composed of 6 machine guns, 3 caissons, 2 provision wagons, 1 forage wagon, 1 baggage wagon, and 1 victual wagon. Each of these wagons except the last two is drawn by 4 horses. The detachment takes almost the same place in the column of march as a battery and requires the same measures for safety—that is to say, it must be retained at the rear.

Although the machine gun has almost the fire power of a half company, it can not be employed in the same way; it can enter into action only with the infantry and the cavalry and covered by them. One of the first participations of the new arm in combined maneuvers has already shown how dangerous it is to give a definite task to a detachment of machine guns by themselves. In an exercise for the protection of the frontier, in the valley of Markirch, the Tenth Battalion of Chasseurs, representing the enemy coming from the French frontier, had arrived at Lebereau, a place passably shut in, and had halted there. The commandant of the chasseurs sent the machine guns forward on the left flank on a mission which should have been executed by a body of infantry. Shortly afterward the machine guns had their retreat cut off

by the enemy. The small number of men serving the guns and the slight mobility of machine guns in marching position, as they could not leave the road, would not have permitted retreat, even in case of real war.

Practice soon furnishes the principles for the rational employment of the arm. It must remain as much as possible under higher direction, in order that it may be employed at the decisive moment to develop the greatest possible efficacy of infantry fire in restricted space. It is thus particularly appropriate for the defensive where it can mow down the adversary by a storm of projectiles at the moment of the forward rush. It can equally be employed with advantage in mountain warfare. That was well shown in the Vosges during the first experiments. A single machine gun skillfully posted and hidden as much as possible at the entry of a defile can retain a considerable hostile mass and force it to make long detours, if, for example, it can beat with continuous fire a section of narrow road over which the enemy is obliged to pass. The machine guns can also be attached to important corps of cavalry or of infantry brought together and mounted, if it be permitted to so express it.

Against infantry the machine gun has the advantage of forming an objective which is difficult to hit and which it is scarcely possible to locate if it is well concealed. This murderous little machine can completely disappear behind the stalks of a field of potatoes. On the other hand, a single infantry projectile can put the arm *hors de combat*. It may also happen that an accident to the loading mechanism may occur fatally at the most critical moment and render the arm useless. This is why the new drill regulations for machine-gun detachments fix the principle that the machine gun should never be used singly. There must always be two machine guns simultaneously employed in a section. At short distances—that is to say, up to about 800 meters—the machine gun is superior to artillery and to infantry. At the long distances it shares with the latter the fate of the weakest. A detachment of machine guns can almost always repel with success a cavalry attack. If it is on the march the piece can be fired without dismounting it from the carriage. In case of emergency the men serving the piece are armed with the carbine for their personal defense.

The new special arm has developed itself in the course of years, starting from the experimental detachment of the year 1899, which was composed of chasseurs as gunners and of Badenese artillerymen as drivers and for the care of the horses. It was soon given a special uniform, which in Prussia is composed of a gray-green tunic with falling collar and red facings and the shako of the chasseurs in yellow leather instead of black.

Little by little there has been formed a special corps of officers of the reserve for these detachments, which for the past year accept one-year volunteers. At present there are 16 machine-gun detachments in the German army, which are assigned as follows: Two to the Body Guards, 3 to the First Army Corps (West Prussia), 1 to the Third Army Corps (Brandenburg), 1 to the Sixth Army Corps (Silesia), 1 to the Twelfth (Saxony), 2 to the Fourteenth (Baden), 2 to the Fifteenth (Alsace), 1 to the Sixteenth (Lorraine), 1 to the Seventeenth (East Prussia), 1 to the Nineteenth (Saxony), and 1 to the First Bavarian Army Corps. Five detachments are accumulated on each of the frontiers—eastern and western. The machine guns will have to render the first precious services for the protection of the frontiers and with cavalry divisions to cover the deployment of the armies.

MACHINE GUNS.

Translated from *La France Militaire* of March 3, 1905, for the Second Division, General Staff, U. S. Army, by Capt. GIRARD STURTEVANT, Fifth Infantry.

Streffleur's Austrian Military Times,^a always full of interesting items and articles of research, has just devoted to the subject of machine guns a discussion from which we may glean some information upon the importance the question of machine guns is assuming in the different armies, and which sums it up very well. We shall confine ourselves to completing this discussion upon certain points of detail.

Up to the present time the question has received the most complete solution in Germany. They have there 16 detachments of 6 Maxim machine guns each in the home army, besides detachments in the colonies. These detachments, for the purposes of administration and instruction, are attached to battalions of infantry or chasseurs, which furnish them their cannoneers after the instruction of the latter has gone as far as the school of the company. The drivers come from the mounted troops, where they have put in a year's service. The mounted troops likewise have to furnish the horses, completely trained.

The detachment includes:

In time of peace, 4 officers, 87 men, 18 saddle horses, 36 draft horses, 6 machine guns (drawn by 4 horses), 2 ammunition wagons (drawn by 4 horses), 1 battery wagon (without horses), 1 reserve gun (without horses).

In time of war, 4 officers, 120 men, 80 horses, 6 machine guns, 9 ammunition wagons, 1 battery wagon, 4 wagons of the regimental train, *i. e.*, forage, provision, and baggage wagons.

The machine gun fires the cartridge of the infantry rifle 8 millimeters (caliber .315). It is placed upon a sledge carriage borne upon a carriage with wheels attached to a limber. It may be drawn by wheeling the piece in case of surprise or cavalry attack; but as a rule the sledge is taken off the truck car-

^a"Streffleurs Oesterreichische Militärische Zeitschrift."

riage in order to assure a readier transportation. Each piece is served by 1 gunner and 4 cannoneers, armed with a carbine and bayonet. The drivers have a saber and automatic pistol. The detachment regularly carries with it 87,000 cartridges, which are fastened in belts of 250 rounds.

The fire is delivered 1 shot at a time^a (instruction firing), in series^b of about 25 rounds, or continuously.^c This latter may be upon a fixed point^d or by playing a stream,^e as it were, in a vertical, horizontal, or oblique direction.

In action the whole detachment is, as a rule, engaged at one time; a section of two pieces may be detached, but never one piece by itself. It is exceptional to unite several detachments. Except in open country, a support is useless. Machine guns are to avoid directing their fire upon lines of skirmishers behind cover; as far as possible, they leave to the other arms of the service the duty of taking care of the machine guns of the enemy.

The machine guns do not have to worry about cavalry attacks. Against artillery they must act at as close range as possible and against its flanks. Their use is to be reserved for decisive moments; and it must not be feared, except at these moments, to withdraw them from fire.

The machine-gun detachments are at the disposal of the commanding general, who generally indicates the object of the fight and the objectives.

The detachment commander selects his position, his particular objective, orders fire to be opened; the chiefs of section regulate the particular location of their pieces and the sector of fire; the gunners, the position to be taken (standing, kneeling, sitting, or prone).

As far as possible one will go into action by going into battery under cover—and as a surprise.

On the offensive the place of the machine guns is with the advance guard; with the cavalry, when necessary, in order to facilitate the seizure of valuable points of ground. They do not have to get nearer than 800 meters (875 yards) apart, the distance of their greatest range, nor to change their positions, for that would interrupt their fire.

On the defensive the machine guns are at first kept in reserve, in order that they may be put in where they may

^a Einzelfeuer. ^b Reinenfeuer. ^c Dauerfeuer. ^d Punkfeuer. ^e Strenfeuer.

oppose attacks or aid in counter attacks. They are also used for supporting by their fire a threatened flank, for flanking probable points of attack, or for firing upon points where the enemy must appear, etc.

In conjunction with the cavalry they take an important part in pursuing the enemy, or in a retreat by strengthening the defense by their fire. Their use is also contemplated with cavalry acting alone, with the aim of increasing the offensive and defensive power of mounted troops, and facilitating for them the execution of their strategic missions.

In the insurrection in southwestern Africa machine-gun detachments rendered excellent service against the natives, especially in those colonies where the force was small. It was even stated in certain reports that their moral effect upon the natives was greater than that of artillery.

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England, on account of her numerous colonial expeditions, has greatly extended the use of machine guns, of which, as an instance, she made great use during the Anglo-Boer war. It is the Maxim machine gun that is most generally used in England; it fires the infantry cartridge of 7.7 millimeters (caliber .303); however, there are also a few Gardner and Nordenfeldt guns in use. These machine guns are mounted on carriages of very different principles, and the grouping of the pieces is likewise quite various. For mounted troops there is a machine gun mounted on a two-wheeled carriage provided with a solid shield and drawn by two horses. Attached to infantry, the machine guns are drawn by a single horse. Probably there are also in the colonies machine guns carried by pack animals and intended to operate either with cavalry or in mountainous country.

In India there are machine-gun detachments of 4 and of 6 pieces. In the home troops each infantry and militia battalion and each cavalry regiment has 1 machine gun; the mounted infantry battalions and the regiments of yeomanry, which in reality are the same thing, have a section of 2 guns. Machine-gun sections or detachments have also been organized, but only temporarily and by way of experiment.

The supply of ammunition is 10,000 cartridges to each piece for foot troops and 20,000 to each piece for mounted troops.

As is seen from the foregoing, although the English army

employs machine guns upon a very large scale, the question of the use of these implements of war has been much less simply and much less completely solved than in Germany. Neither have they arrived at such simple and logical principles for their tactical employment.

The machine guns, contrary to the German system, which consists in grouping them in detachments, are used, as a rule, separately or in sections of two pieces, with a view of placing at least one at the disposal of every fighting unit and with the hope of better concealing them. It is recommended that they be used on the offensive at long range, in order to help acquire a superior fire; on the defensive, on the other hand, they are reserved for flank effect at short ranges.

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RUSSIA: THE ORGANIZATION OF MACHINE-GUN COMPANIES IN 1904.

Translated for the Second Division, General Staff, U. S. Army, from the *Revue d'Artillerie* for January, 1905, by Capt. JOHN E. McMAHON, U. S. Artillery Corps.

In 1901 the Russians organized for a term of three years 5 companies of machine guns, which were assigned to infantry divisions and a brigade of chasseurs. At the completion of the experiment an imperial order of September 13/26, 1904, fixed the organization of these companies. We give a résumé of this organization below:

Machine-gun companies are divided into field and mountain. The former are made up of 8 Maxim guns, caliber 7.6 millimeter (0.30''), like the Russian rifle, with carriage and two-horse limber, and 8 one-horse caissons.

The mountain companies have likewise 8 Maxims; but they are carried on pack horses. The ammunition is carried by 8 pack horses and 8 one-horse caissons.

In time of peace the companies have horses for only 4 guns, with 4 pack horses in the mountain companies.

The gun detachment consists of 1 noncommissioned officer, 1 gunner (*Gefreite*), and 2 cannoneers.

The allowance of ammunition is not given. It used to consist of 5,850 cartridges per piece in 13 belts of 450 each, of which 3 belts were carried in the limber and 10 in the caisson.

The reserve train of each company consists of 9 one-horse wagons, of which 2 carry spare parts, 1 is the forge for the horses and matériel, 1 carries officers' baggage, 5 are ration and baggage wagons for the men, with 1 two-horse field kitchen.

The machine-gun companies are attached to infantry divisions or to brigades of chasseurs. They take the number of their division or brigade and belong, for purposes of administration and preparation for war, to one of the regiments of the

division, preferably to the one which is stationed near the headquarters of the division, and are placed under the orders of the colonel commanding the regiment without forming part of any battalion.

The captains of the machine-gun companies, nominated by the division commanders from among the candidates that have shown the most familiarity with target practice or from the most deserving company commanders, are designated in general orders. The other officers are selected by the division commander from the regiments under his command.

Each company is entitled to a *Feldwebel* and two reenlisted noncommissioned officers.

The noncommissioned officers who are candidates for machine-gun companies form part of the special instruction detachment of the regiment.

Recruits are selected from those assigned to the artillery. They must have excellent eyesight and a vigorous constitution and know how to read and write.

The remount service is the same as that of the artillery. The administration of the machine-gun companies is the same as that of the other companies of the regiment. They take part in all regimental drills and instruction. They may be sent to a target range for their machine-gun practice.

The following tables give the organization in detail of the personnel, matériel, and animals of a machine-gun company, beginning with the year 1904:

TRANSLATIONS PERTAINING TO MACHINE GUNS. 49

Personnel of a machine-gun company (1904).

	Field com- pany.		Mountain com- pany.	
	War.	Peace.	War.	Peace.
OFFICERS.				
Company commander (captain or lieutenant-colonel) . . .	1	1	1	1
Officers	4	3	4	3
ENLISTED MEN (COMBATANTS).				
Feldwebel	1	1	1	1
Noncommissioned officers:				
Chiefs of section	8	8	8	8
Chiefs of caisson	1		1	
Armorer	1	1	1	1
Trumpeters	2	1	2	1
Cannoneers assigned—				
To the guns	24	24	24	24
To the ammunition packs			8	4
To the caissons	8		8	
Mounted men and drivers assigned—				
To the guns	8	4	8	4
To the ammunition packs			16	
To the caissons	8		8	
Drivers for the spare horses, orderlies, and other special- duty men (cook, baker, etc.)	20	15	20	15
ENLISTED MEN (NONCOMBATANTS).				
Hospital attendant	1	1	1	1
Artificers	3	3	3	3
Teamsters:				
Spare-part wagons	2		2	
Forge	1	1	1	1
Officers' baggage wagon	1		1	
Company baggage wagon	5		5	
Driver for field kitchen	1		1	
Total enlisted men	95	59	119	63

The enlisted men are armed with carbine and bayonet.

50 TRANSLATIONS PERTAINING TO MACHINE GUNS.

Allotment of horses for a machine-gun company (1904).

Horses.	Field com-pany.		Mountain com-pany.	
	War.	Peace.	War.	Peace.
SADDLE HORSES.				
Officers' horses.....	5	4	5	4
Men's horses:				
Feldwebel.....	1		1	
Noncommissioned officers.....	8	4		
Drivers.....	1		1	
Trumpeters.....	2	1	2	1
Spare saddle horses.....	1		1	
Team and pack horses:				
Guns.....	16	8	24	8
Caissons.....	8		8	
Spare horses.....	2	1	3	1
Draft horses for wagon train:				
Spare-part wagons.....	2		2	
Forge.....	1		1	
Officers' baggage wagon.....	1		1	
Company baggage wagon.....	5		5	
Field kitchen.....	2	2	2	2
Spare horses.....	1		1	
Matériel.....	56	20	56	16
FIGHTING BATTERY.				
Maxim guns with carriages.....	8	4	8	4
Two-horse limbers.....	8	4		
Pack horses for guns.....			8	4
One-horse caissons.....	8		8	
Pack horses for ammunition wagon train.....			16	4
Spare-part wagons.....	2		2	
Forge, etc.....	1		1	
Officers' baggage wagon.....	1		1	
Company baggage wagon.....	5		5	
Field kitchen.....	1		1	

Each limber carries 3 belts of 450 cartridges each and each caisson 10 belts of 450 each. The ammunition is the same as that of the infantry rifle, caliber 7.6 millimeters (0.30 inch), model 1891.

In October, 1904, the Russian army had 6 companies^a of machine guns attached to the First, Second, Third, Fourth, Fifth, and Sixth Divisions of the East Siberian Chasseurs.

^a See *Revue d'Artillerie*, vol. 58, p. 518; vol. 46, p. 143, and *Revue Militaire des Armées Étrangères*, 1st semi-annual, 1904, p. 471, and 2d semi-annual, 1904, pp. 85 and 545.

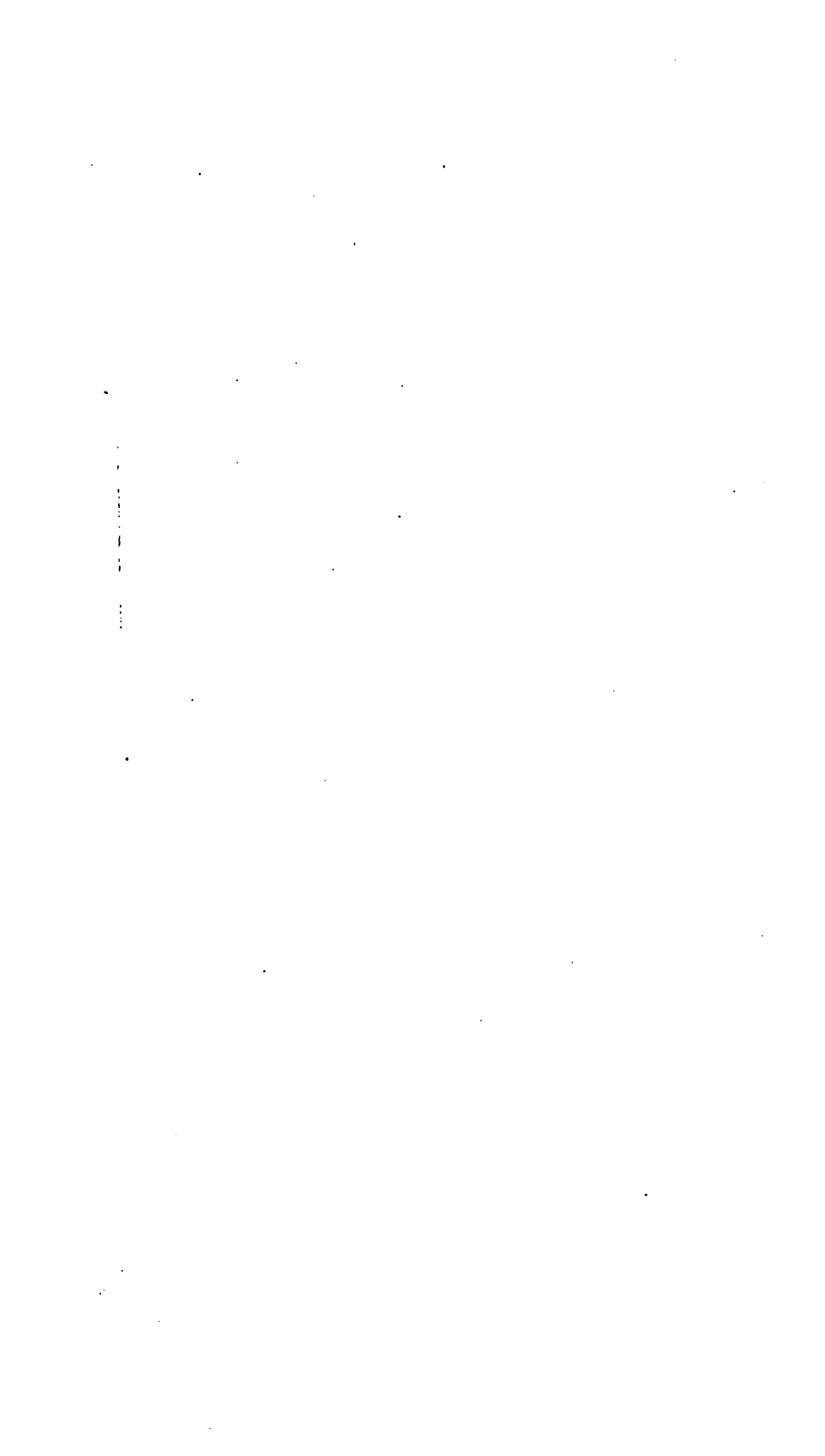
By imperial order No. 676, November 6/19, 1904, there were created 6 new companies in the Fourteenth, Fifteenth, Twenty-Fifth, Thirtieth, Fortieth, and Forty-first Infantry Divisions. These companies are kept on a war footing.

DISTINCTIVE MARKS OF A MACHINE-GUN COMPANY.

The personnel of the machine-gun companies (imperial order of October 7/20, 1904) wear the uniform of the division or brigade to which they are attached, but with the following differences:

The shield on the collar of the tunic and greatcoat is crimson. On the epaulettes and shoulder straps of officers and on the band of the men's forage cap, above the number of the division or the brigade, are placed the letters П.г., the first letters of the word *Poulemetnaia*—machine-gun company.

(From *Rousskii Invalid*, Nos. 260 and 266, 1904, and *Viestnik Ofitzerskoï Strielkovoi Chkoly*, supplements to Nos. 114 and 116.)



THE RUSSIAN MACHINE-GUN COMPANIES.

From the *Kriegstechnische Zeitschrift*, Part II, 1905.

Translated for the Second Division, General Staff, U. S. Army, by Capt. FREDRIK L. KNUDSEN, Eighth Infantry.

In the summer of 1901 were organized experimentally 4 machine-gun companies in Russia and 1 company in Asia. Of the first, 2 were placed under each of the commanders of an infantry regiment (Fourteenth and Thirtieth) and 2 under each of the chiefs of staff of a division (Sixth and Sixteenth). After a three years' trial of the organization and training the Regulations for Machine-Gun Companies and their Status now have been adopted by the decree of the council of war of September 2/15, 1904.

Not without interest is the account in the *Wojennyj Sbornik*, Part 10, 1904, of the organization of one of the companies, of the experience which was gained thereby, and of the training, use at maneuvers, etc. The regiment was in a camp of instruction as the officers and men assembled for the company, and 2 artillery officers reported as instructors. No quarters were provided either here or in the garrison, 75 kilometers away. The accommodation of men and horses was provided for very scantily. It was not until the third summer (1903) that materials for sheds and stables were for the first time at hand in the camp. In garrison also there was at first much to be wished for.

The company commander and the officers entered upon the task entirely without experience. The instructors showed themselves to be very useful officers, who understood excellently how to instruct the company in the management of the material and horses. As a basis for the initial training they used the Description of the Three-line Machine Gun, Maxim System, and the literature of both home and foreign countries

pertaining thereto. Regulations, or even provisional instructions, for the service were lacking altogether. Outlines for the firing regulations and other provisions arrived first after the close of the first target year, so that the company, by piecing together the regulations of the different arms, had to make for itself drill regulations and regulations for the interior service. Line, column of pieces, as well as section column, were chosen as formations. The packing and distribution of the material were, besides, to be determined, the handling of the same to be learned, instruction to be given in the care of horses, and the individual training with the rifle and machine gun to be carried on. The company commander was compelled, in the absence of any instructions, to experiment with his method of firing and practice with his subordinates. In order to make clear the tactical use of the machine gun, the first company that had just been organized, participated in the fall maneuvers and was then inspected shortly after returning to the garrison. The period of winter service was also thoroughly utilized in every respect for theoretical study. The first careful summer training now followed this in a regular course, based on regulations that had arrived in the meantime, which naturally necessitated many changes in the service. In the spring of 1902 different improvements were made in the material through the firm of Maxim. Then the company was presented to the minister of war.

The order issued on the basis of the reports from all places concerned now establishes the following for the machine-gun companies: The machine-gun companies will be organized in the infantry or rifle divisions (or brigades) and carry the numeral designation of their division. They are under the division commander also as regards their tactical use. They are assigned to a regiment, usually at division headquarters, on the recommendation of the division commander through the commander of the military district. They are, without becoming a part of the battalion organization of these regiments, placed under the regimental commander and higher superiors as regards the interior economy and instruction. As the company commander is recommended through the division commander within the territory of his command, one of the most efficient company commanders, or one in line for promotion to this

position, is nominated thereto by the sovereign. The other officers of the company are assigned from the regiments of the division, and they return again to their regiments when they receive a company. There are no advantages of advancement connected with the assignment to the company. The companies receive the special quota (scarcely any illiterates) under the regulations governing the filling up of the field artillery. The training for noncommissioned officer takes place in the regimental instruction detachment. The company has three places for reenlisted men. The supply of horses is regulated as prescribed for the field artillery.

Machine-gun companies were already organized in the army in Manchuria before the issue of the order. The companies of the Second and Sixth East Siberian Rifle Divisions have now become established by regulations. They have the same uniforms as the rifle regiments. A company consists of the commander, 4 officers, 119 noncommissioned officers and men, and 50 horses. Only the officers, the first sergeant, and the trumpeter are mounted; all the others are on foot. The armament of the company consists of 8 three-line machine guns, Maxim system, on pack horses. The guns have the same ballistic properties as those formerly used, but are less complicated and of greater durability. The gun in its case weighs, with water for cooling, 31.75 kilograms, the carriage 20.38 kilograms, the whole load of the pack horse 90 kilograms. With the gun is a loading belt (for 250 cartridges). To every gun belong 2 pack horses with ammunition boxes and a two-wheeled ammunition cart. The machine gun fires up to 600 shots a minute. The company has at its disposal 7,000 cartridges.

It is remarkable that every machine-gun cannoneer is himself armed, as the infantry soldier, with rifle and bayonet. The company carries for this reason only 8 spades with it, and it would require for a complete cover, certainly behind a strong breastwork with a covered way between the single guns (according to the data of the commander of one of the companies), 120 laborers and 60 spades for from five to six hours.

The tactical use of one of the companies at Liao-Yang on the 17th and 18th of August gave it an opportunity to open fire on a mountain battery coming into position and to come into

action several times on the flank of its division, notwithstanding the covered foreground, so effectively that the rarely-distributed Order of George was conferred on its commander and officers. The company had fired 26,000 shots on both days. It had a loss of 30 per cent in killed and wounded. Its conduct in the action deserves praise, so much the more as it had been organized with 85 men in Liao-Yang not very long before its first use at Ta-shih-chiao (July 24) from a small nucleus of men trained at home and three officers ordered to it.

A RUSSIAN MACHINE-GUN BATTERY AT THE BATTLE OF LIAO-YANG.

From the *Revue d'Artillerie* of January, 1905.

Translated for the Second Division, General Staff, U. S. Army, by Capt. JOHN E. McMAHON, Artillery Corps.

The rôle of the machine gun in modern war is a problem which has not as yet been definitely solved, since the proper solution has not yet received the sanction of experience. One would scarcely have the temerity to draw definite conclusions from operations so different from our European campaigns as the war in Cuba or the Transvaal. The Russo-Japanese war, on the contrary, should furnish us on this point, as well as on many other subjects in dispute, most valuable information. For this reason we believe our readers will find interesting the following account of the operations of a Russian machine-gun battery written by an officer of the battery and published in the *Rouskii Invalid* (No. 25, Oct. 15/28, 1904):^a

"No one, I believe, has as yet spoken of the machine gun in this war. I take up my pen, profiting by a short rest near the tombs of the Emperors, in the village of Fou-Lin, and set about writing down what I saw during a journey of 9,000 versts and three battles, one of which lasted two days at Liao-Yang.

"We left the city of O—— with a small detachment of 2 officers, 34 men, the matériel, and the horses.^b On leaving we went through the usual course of toasts, champagne, and tears. The engine whistled, and we were off.

"The first thought that came to our minds amid the noise of the engine and the rattling of the cars was this: Where are

^a An extract from this account appeared in *La France Militaire* November 15, 1904.

^b See p. 49 for the composition of a Russian machine-gun battery. (Field-gun battery on a war footing consists of 5 officers and 95 men, with 56 horses, 8 30-caliber Maxims, 8 two-horse limbers, 8 pack horses for the guns, 8 one-horse caissons, and 8 pack horses for ammunition. Each mountain battery has 5 officers and 105 men, with 16 pack horses for ammunition instead of 8.—TRANSLATOR.)

we to be mobilized? I looked at the itinerary and was seized with fright: the extreme point, Liao-Yang! Surely we are in no condition to go there, where the headquarters of the army are hard at work and where we should arrive completely organized and ready to go on the firing line. From the beginning of this long trip the first and most serious annoyance was the consciousness of a grave responsibility, at the same time not knowing how, where, or when we were to stop en route to fill up our complement with 3 officers, 67 men, and 20 horses. Evidently very little is known of the special rôle we are to play on the field of honor. I have devoted three years to preparing myself, and I believe a good *mitrailleur* can not be produced in less time. We have our drill, regulations, manuals, and special instructions, the existence of which is certainly not known to everybody.

"I have a proof of this at hand. When, in the month of August, I asked the following question of one of the officers who had commanded a body of cavalry operating in Southern Manchuria: 'Would not my machine guns be useful to the cavalry by combining the rapidity of that arm with the fire effect of the infantry rifle?' I followed this by offering him the use of my gun pointers, but received the reply: 'Machine guns are useful only when employed in the way the Japanese use them, and even they do not know very much about them. We have no need of your gun pointers; our troopers know how to shoot with rifles, and we can easily detail men to serve the machine guns.' Another cavalry commander offered me his men and tools with which to dig trenches for the machine guns, being ignorant of the fact that each battery has 8 spades with its second échelon and that each chief of platoon is responsible for a gun, a horse, a carriage, and, unfortunately, a rifle and bayonet. Trenches for 8 guns require the labor of 100 men with 60 large spades, working from five to six hours, according to the nature of the ground. From these incidents it is clear that our special arm is not familiar to the army at large.

"One of two things should be done. Either specialize our arm or attach it to the infantry—that is, equip each regiment with 1 or 2 machine guns. But the experience of modern war will show the necessity of regarding machine-gun detachments as a new and distinct arm.

"I intend discussing in this journal, at some other time, the future of the machine gun; for the present I propose to describe the part played by these guns in the action at which I was present, the battle of Liao-Yang, August 17-18/30-31, 1904.

"My guns received their baptism of fire from the enemy's field guns July 11, at Ta-shih-chiao, where men and horses remained for fifteen hours under a cross-fire. To stand there with folded arms under fire, not even having a chance to do anything, was very disagreeable, although the losses were insignificant—2 men and 1 horse wounded.

"On August 16/29 an order from the commanding general of the division to which my battery belonged directed me to move to the right flank of the position, where I was to occupy the southern edge of the village of Goutsiaty during the night of August 16-17/29-30. My position was as follows: 400 paces to the left of the railroad embankment and behind the Liao-Yang heights. In front of these heights was the village of Maïetoun, with two round hills to the south of the village. The village, as well as the heights, were occupied by the N—— regiment. To the front and south of the village of Goutsiaty the gowliang^a had been cut up to within 900 paces (650 meters), and in the distance, at a little more than 2 versts (2 kilometers), one could see the village of Bésymiannoï, and at 3 versts (3 kilometers) the village of Datchjaotsiatai. The left or eastern hill was about 2 versts from the edge of the village of Goutsiaty.

"It was at 8 a. m. August 17/30 that contact was established between the advanced lines of the enemy and the frontier guards, supported by two companies of the N—— regiment, at the crossing of the railroad embankment, near the southernmost hill. The machine-gun battery, on account of the distance, 3,000 paces (2,150 meters), could not take part in this affair. Later on, toward 10 o'clock, several horsemen appeared near the railroad track; fire having been opened on them from the top of the two hills, they took refuge in the gowliang to the west of the embankment, but it was possible to follow them by the movement of the gowliang, and, a little later, in a spot where the grain was less dense, at a range of

^a Gowliang is nothing more than very tall millet (10 to 12 feet), in which it is easy for troops to conceal themselves.

approximately 1,300 paces (about 900 meters), one could clearly distinguish the horsemen and behind them the pack horses and the cannoneers. It was evident that a mountain battery was trying to advance unseen, in order to take in reverse the two hills occupied by two battalions of the N—— regiment.

“The target was an excellent one for machine guns, and it became imperative to take advantage of the favorable moment to overwhelm the battery. Ranging was not to be thought of. Fire was opened at once, the first piece firing at 1,200 paces, each of the others increasing the range by 25 paces.

“As soon as we began firing the battery obliques to the right toward a denser part of the gowliang, but it was too late. Every living and moving thing fell under the rain of bullets. The machine guns had fired 6,000 cartridges, but the importance of the target justified the expenditure. I ordered the fire to cease one minute and a half after it opened, because there was no longer an objective to fire at.

“Two hours passed in absolute calm; one could not even hear isolated shots fired at us. About noon we noticed on the railroad track toward the west the movement of isolated individuals who evidently were trying to occupy the embankment and thereby take us in rear. This was not to be tolerated. Six different times we opened fire at different elevations, using zone fire with sweeping.^a As the Japanese were passing one by one and at different distances it was necessary to use different ranges. Perceiving that this movement was not succeeding they ordered a slow and regular attack on the village of Goutsiaty by lines of skirmishers, but their reiterated attempts resulted only in their reaching the place where the gowliang had been cut. Up to nightfall it was impossible for them to advance a step farther.

“The coming of night, by rendering the machine guns powerless, allowed the Japanese skirmishers to approach within easy range, and until morning, almost without interruption, they kept us awake by a fusillade, which, however,

^aZone fire with sweeping consists in firing a certain number of rounds at different elevations, at the same time swinging the gun from left to right and back again. By this means a zone or rectangle is covered by a hail of projectiles.—Translator.

caused but little loss. At dawn we fired a belt of cartridges to drive the isolated skirmishers from the edge of the gowliang. Everything was quiet for a half hour, when a few shots revealed the presence of a few skirmishers near the place where the gowliang was cut. One had only to raise a hand or a head, a pair of field glasses or any other object, to hear immediately the sound of shots and the whistling of bullets.

“These skirmishers were so annoying that some men asked permission to attack them with the bayonet. I granted it, and 15 men, selected from the horse holders and orderlies and led by a noncommissioned officer, leaped over the parapet. The Japanese, to the number of 25, rushed forward to meet them. A Japanese officer, threatened by the bayonet of Private G——, threw away his saber and shot the soldier in the foot with his revolver. The officer was at once pierced by the bayonet of Private Ch——. Two men carried G—— behind the parapet in order to dress his wounds. The non-commissioned officer S—— killed 3 Japanese with his bayonet, but the weapon unfortunately remained stuck in the body of the third, so that it could not be withdrawn, and a fourth adversary shot S—— at close range. This Japanese was at once killed by Private A——, and the 5 dead men fell in a heap. This fight ‘a l’arme blanche’ lasted only a few minutes, and not a single Japanese was left alive in front of us nor another shot fired until 2 o’clock in the afternoon. We then were able to get a little rest, to eat a luncheon of biscuits and water, and to contemplate our trophies—rifles, an officer’s saber, etc.

“At 3 o’clock in the afternoon several Japanese appeared near a little bridge on the railroad, one of whom was signaling with a yellow flag. This went on for about an hour without our skirmishers being able to hit him, on account of the long range, 1,500 paces (1,050 meters). I then ordered the fourth platoon to drive him from the bridge in order to stop the signaling. The chief of platoon fortunately took advantage of the moment when 2 Japanese were coming out from under the bridge with flags; he fired his first piece at 1,450 paces and the second at 1,500, when the signal work ceased once for all.

“About 5 o’clock in the afternoon the movement of lines of skirmishers began in the gowliang, with the object of turning our right flank near the village of Baitsialiaogouavo, where

the millet had not been cut and where we were obliged to fire frequently at a road hidden in the gowliang, leading to the village of Datchjaotsiatai.

"It was only on August 18/31, toward 7 o'clock in the evening, that the Japanese decided to drive the machine guns from the village of Goutsiaty by means of artillery fire. Upon learning that their infantry had received a check they had placed in the village of Datchjaotsiatai a battery which overwhelmed us, and the village also, with common shell, shrapnel, and torpedo shell. Although the men were sheltered by a mud wall a great many were wounded, and we were not able to breathe freely until nightfall, when the fire, to which we absolutely could make no reply, ceased.

"At 9 o'clock at night I received the order to abandon the position. In two days of battle we had lost 30 per cent of the personnel in killed and wounded, and had fired 26,000 cartridges.

"At 2 a. m. August 18-19/31-1 furious cries of 'Banzai, Banzai!' announced an attack by the Japanese upon our compatriots, but on reaching the village of Goutsiaty they did not find the machine guns, which were at that moment safely behind Liao-Yang."

The task given the battery of preventing the Japanese from taking in reverse the two hills and the village of Maïetoun had been performed by the machine guns.

The commanding officer of the battery, Captain Sourine, received for this the order of St. George of the fourth class, all the other officers of the battery obtained decorations, and to the men were allotted ten crosses of St. George.

The first conclusion to be drawn from the account of the Russian officer is the well-settled fact that machine guns can not engage artillery. This conclusion agrees with the teachings of the war of 1870; it will not be seriously controverted by anyone. Under accurate artillery fire machine-gun batteries can only cease firing and seek the best shelter available, while awaiting a favorable opportunity. This is comparatively easy for them, as the size of their matériel makes it difficult to see them.

At ranges in the neighborhood of 1,000 meters (1,100 yards) it is possible to inflict instantaneous destructive losses on troops in motion, provided zone fire with sweeping be used.

This is what happened to the Japanese mountain battery referred to in the above account. At the same range fire can be opened on individual men with more or less effect if the distance is approximately known.

At ranges under 700 meters (900 paces) the Russian machine guns have shown a constant superiority over lines of skirmishers, which they have always succeeded in stopping in open ground.

Finally, the Russians seem to admit that beyond 2,000 meters (2,100 yards) there is no use of even trying to employ machine guns.

The consumption of ammunition was not excessive; 6,000 cartridges represent the same number of projectiles as 20 shrapnel, and they require the same length of time to be fired. To obtain the same number of shots in the same time, it would have taken 400 infantrymen, and the results would probably have been inferior.

On the other hand, the consumption of 26,000 cartridges in two days of battle, or 1,600 rounds per gun each day, does not make a very large demand on the ammunition-supply trains. Each Russian machine-gun battery carries with it 5,850 rounds per piece.^a

Machine guns should always employ zone fire with sweeping; but, as ranging is often difficult, if not impossible, with these pieces, it is imperative to make use of an instantaneous range finder, and, above all, to reconnoiter and register as accurately as possible the entire zone of action. In other words, the groups or batteries of machine guns should always act like batteries "en position de surveillance,"^b and be always ready to open an accurate fire on any given point.

^aSee *Revue d'Artillerie*, vol. 58, p. 518, and vol. 65, p. 323.

^bBatteries "en position de surveillance" are those which have prepared beforehand all the elements of fire for the prominent points in the zone of action and are ready to open fire at once on any target appearing near these points.



FIGHTING BETWEEN INFANTRY AND MACHINE GUNS.

By E. VUILLEUMIER, Captain in the Swiss General Staff.

From the *Revue Militaire Suisse* for September and October, 1904.

Translated for the Second Division, General Staff, U. S. Army, by A. G. CLERGUE.*

From whatever side our army may be called upon to fight to-morrow it will be almost sure to find itself opposed by machine guns. Those of our neighbors' armies which do not yet possess this weapon would probably introduce it in their armament in case of war.

In Germany in 1902 there were created 13 subdivisions of machine guns, attached administratively in time of peace to the battalions of chasseurs or of fusiliers, but which in time of war would be under the orders of the officer commanding the army corps. They have been incorporated into the army of the frontier: Fourteenth at Carlsruhe, Fifteenth at Strasbourg, and Sixteenth at Metz.

The subdivision comprises 3 sections of 2 guns each. The German army would thus have 78 machine guns at its immediate disposition. The weapon selected is the Maxim machine gun mounted on a four-wheeled carriage.

In Austria only the regiments in garrison in the mountains and on the frontiers and the groups of fortresses are provided since 1898 with machine guns, model "Archiduc Salvator."

The *Militär Wochenblatt* (No. 97, p. 2,549, of 1898) declares that the batteries of the divisions of independent cavalry comprise 4 guns and 2 machine guns. We would not vouch for this. But the study of the different systems of machine guns continues constantly. The budgets of the Empire carry large sums of money set apart for different trials, and the reports of maneuvers, as well as review articles, all aim at the introduction of machine guns in the equipment of operating troops.

Italy has in her armament 100 machine guns of the Pratt-Whitney system. The army used them in its Abyssinian

*Forwarded to the General Staff by Maj. ROBERT N. GETTY, First U. S. Infantry.

campaign, but without much success, and they did not order any new ones; but many of the Alpine posts have been armed with them, and some recent publications point to the revival of the study of this gun and of its general introduction.

In France the investigation and trial of machine guns has been going on for a number of years. It is proposed to assign 1 gun to each detached company in distant lands and in mountain warfare. Each battalion of an expeditionary force can have 4 guns "so as not to be always supported by heavy artillery, which can not be transported and taken everywhere." At the present time in the Vosges the Fifth and the Fifteenth Battalions of Chasseurs, in garrison at Remiremont, are provided with 4 Hotchkiss machine guns (July, 1901); the Sixth and Thirtieth Battalions of Alpine Chasseurs, the Fourteenth and Fifteenth Corps, at Grenoble, Nice, and Embrun are provided with machine guns of the same system. But, instead of being on wheels, the guns are carried on mule packs. They claim that 4 other battalions of light infantry are also using the Hotchkiss, but as an experiment.

Some platoons of machine guns on wheels have been experimented with at the cavalry maneuvers of August, 1902. They were attached to the horse batteries and considered quite a success. They have recently made trials of these guns mounted on horses and attached to and incorporated with the troop. These different trials are going to be carried on with so much the more activity since the first news of the Russo-Japanese war and of the campaigns against the Herreros confirms the good results obtained by both sides at the time of the war of the Transvaal.

The general works on tactics and the pamphlets and review articles relating to machine guns—there are no special works in any degree complete on the subject—treat of the benefit of introducing this new engine of war. They enumerate cases in which its use would be advantageous. Some—a few—propose rules of tactics which ought to govern its use; but no one suggests a way to oppose the machine gun or the difficulties encountered in using it; and yet how many times have commanding officers, in our own maneuvers and those of other countries, who have found themselves in situ-

ations identical with those in which to-morrow's war will place them, been faced by this question?

Nonplussed the first time, then only annoyed, but always embarrassed, the infantry officers have under the inspiration of the moment made their troops take some formation or another and employed a more or less appropriate means of defense or attack. In fact, no regular system seems to have been adopted and followed—least of all in Switzerland. Actual experience in war is wanting. The conflicts of the English against the African tribes, the Spanish-American and Anglo-Boer wars, the Chinese expedition have not furnished sufficient information. Perhaps the Russo-Japanese campaign and the expedition against the Herreros will supply us with the necessary data.

In their absence we are reduced to reasoning and to good judgment—the source of all true tactics.

A beginning must be made some time. The moment seems to have arrived for discussing this question.

* * * * *

Before commencing an attack or a defense the first thing to know is who the enemy is, what is his strength, and what are his methods of attack and defense. The engagement of infantry against machine guns, the formations to be adopted against them, and the strength of the force to be opposed to them will depend, therefore, on the value of these engines of war themselves and on their method of fighting. These are the first essential points to decide.

I. THE MACHINE GUN, ITS VALUE AND ITS QUALITIES AS AN ENGINE OF WAR.

It is not necessary to enter into the details of the different systems of machine guns and to examine their respective qualities. It is only the fundamental and essential qualities of the weapon itself which concern us here.

The machine gun by rapid and prolonged fire is capable of throwing, in the shape of a thick hail of bullets at the longest ranges 400 to 600 rifle bullets a minute to a distance which is only limited by the eye of the firer. Its essential qualities, therefore, are the range, the rapidity and the accuracy of its fire, and economy in men.

(a) RANGE.

The machine gun produces a murderous effect up to a distance of 1,800 meters. Up to 800 meters its action is particularly in evidence by reason of the density of the cloud of bullets discharged. The distances at which machine guns are most effective are those between 800 and 1,500 meters. The rifle is an effective weapon for a distance up to 800 meters; but at 800 meters and beyond a rifle is necessarily uncertain in the hands of a man when the flatness of the trajectory can no longer compensate for the inaccuracy of aim. At 1,500 meters the fire of the machine gun is still very effective. At 1,000 meters it is as certain and secures as good results as the infantry rifle at 300.

(b) RAPIDITY.

Whereas the rifle is a perfectly effective weapon against a limited target—a single man or a group of men—the machine-gun is greatly superior against deep and extended targets, against the lines or columns of which it discharges a hail of bullets, mowing down the enemy's lines from one end to the other. It is inaccurate to say that a machine gun fires "so many shots a minute;" it would be more correct to say "at the rate of so many shots a minute." However, the point is of small importance, because in reality the firing takes place by fits and starts which never last a minute.

The following table shows the number of shots per minute which the machine guns of different systems are capable of firing:

Maxim (Switzerland Germany), 500 to 700.

Hotchkiss (France), 400.

Archiduc Salvator (Austria), 300.

Nordenfelt (England), 500 to 600.

Bergmann, 600.

(c) ACCURACY OF FIRE.

The fire from a machine gun, resting as it does on a fixed support or tripod, handled at a greater distance from the enemy by a man often isolated and concealed, is more accurate and constant than the rifle, because less subject to inaccuracies caused by agitation, fatigue, and enervation of the firer. Besides, it should be stated that the barrel of the weapon and the cartridge being the same as those of the

infantry rifle the ballistic efficiency of machine guns must be the same as that of this rifle. Shot for shot the rifle, if supported, is equal to the machine gun. It is only when it becomes a question of firing the greatest number of bullets with the greatest possible rapidity over an extended or distant range that the latter has a great superiority.

According to experiments made in Switzerland, firing, shot by shot, resulted as follows:

At 300 meters, 61.5 per cent of hits on the target.

At 500 meters, 32.5 per cent of hits on the target.

Continuous firing resulted as follows:

At 300 meters, 45.5 per cent of hits on the target.

At 500 meters, 26.4 per cent of hits on the target.

Against artillery at 1,400 meters without teams and with the gunners kneeling 7 per cent of hits were obtained, and at 1,600 meters 4 per cent.

According to trials made in Germany at 800 and 900 meters, 20 targets of riflement in line were hit after firing from 200 to 300 shots. There were 13 per cent of hits. At 1,100 to 1,400 meters against 2 mountain guns served by 10 men, 9 men were hit after 120-400 shots; six per cent, 12 per cent, and more of hits were obtained.

It is admitted that the machine gun has the same dispersion (70 per cent) at 1,000 meters as the rifle has at 300.

In Belgium a case of indirect fire at 1,000 meters is cited which gave 50 per cent.^a

(d) ECONOMY IN MEN.

The service of a machine gun only immobilizes a few men.

In Germany the gun is served by a subofficer and 4 men. The company of 6 machine guns comprises 80 officers, subofficers, and soldiers, or 13 to 14 men per gun.

In Switzerland to each gun there is a subofficer and 5 men, of whom one is an assistant gunner, 2 drivers, an ammunition carrier, and a supernumerary. The company consists of 72 men and 8 machine guns, or an average of 9 men per gun. This figure is generally recognized as being too small.

^a *Belgique Militaire*, 1900, p. 611.

In Denmark they have 2 men to handle the machine gun, an ammunition carrier, and 2 men to hold the horses during the firing.

In France, Lieutenant Cesbron-Lavau, in a profound treatise which he has written on the subject with a view to the regular introduction of machine guns with the French army, recommends a squad of 5 men per gun.

(e) COMPARISON WITH THE RIFLE.

In order to fully appreciate the economy in the number of men which the use of the machine gun effects, it is necessary to establish the difference of effect produced by the rifle and the machine gun or, more exactly, the number of rifles which must be placed in the firing line to produce the same effect as a machine gun. Different calculations have been put forward; a man armed with a rifle and using it as a single loader fires on an average 4 shots a minute; the machine gun, once it has been laid, fires 400 to 600 shots; it is therefore equivalent to 100 to 150 men from the point of view of the number of projectiles discharged; but as the fire is more certain, more constant, and better aimed it can without exaggeration be said that, at moderate distances, it is equivalent to a company.

With rapid firing, a company of 200 men armed with repeating rifles, can fire about 3,000 shots a minute. To make this fire as effective as that of the machine gun it would be necessary that 400 bullets (the number of hits obtained in one minute with the machine gun firing at the rate of 500 shots a minute at a distance of 1,000 meters), that is to say, 13-14 per cent. of the shots fired, should hit the target. But this figure is never reached on the battlefield. It may therefore be asserted that under these conditions the useful effect of the machine gun served by a well-trained personnel possessing plenty of sang-froid, is at least equal to that of a company of 200 men.

A dozen years ago, before the last improvements, Captain de Rémur wrote: "Each of these is equivalent to a platoon of infantry at least; besides, the greater range allows of opening fire at a greater distance with complete effectiveness and increases by so much the useful effect produced."

On the 28th June, 1901, Colonel Gremion wrote in the *France Militaire*:

"In stating that, from trials on the target practice ground, the fire of a machine gun was equal to that of a section (a quarter of a company) of infantry, it should be noted in actual warfare the results would be much greater, owing to the riflemen being subject to human emotions, such as fatigue, fear, etc. At the present time it is probably true to say that the fire of a machine gun is equivalent to the fire of a platoon of infantry."

The author does not take into account the influence of distance.

Capt. Pierre Sarasin, in his article already quoted, expresses himself as follows: "The fire-effect of one machine gun company corresponds approximately to that of three normal infantry companies." In his opinion, therefore, 8 machine guns are equivalent to 12 sections, or 1 machine gun to $1\frac{1}{2}$ sections.

These differences of opinion are explained by the fact that some only take into consideration the results of the firing, while others take into account the factors of the battlefield—such as nervousness, excitement, the inequality of marksmanship, the fact that a unit of infantry has not all its rifles in the firing line, but keeps some for supports and in reserve, the length of range, etc. A comparison might also be drawn based on the number of rounds available; but no general deduction can be drawn from such a method of calculation, because the number of rounds available in the case of units of infantry would vary from that which would be available in the case of companies of machine guns.

In Switzerland the company of 8 machine guns, including ammunition wagons, carries 78,080 cartridges. The battalion with its 2 caissons carries 130,560 cartridges.

In Germany the company of 6 machine guns carries 105,000 and the battalions 180,000.

It should be stated here that if it is admitted that the effect of the fire of a company of 6 machine guns is equal to that of 1 battalion this does not mean that it would take a battalion to place a company of machine guns *hors de combat*.

(f) COMPARISON WITH THE FIELD GUN.

We will now take into consideration to what extent the machine gun can take the place of the field gun so as to define the value of the weapon which it is sought to oppose.

The machine gun can not be compared with the field gun in the matter of destructive force at long ranges—that is to say, beyond 2,000 meters. At distances beyond 1,500 meters the effectiveness of the field gun is certainly greater; besides, the artillery projectiles bursting at a good distance undoubtedly produce a more considerable moral effect, and, again, rapid-fire artillery throws 12 to 15 projectiles a minute, say 4,000 to 6,000 bullets and fragments, the dispersion of which is not less close and efficient than the hail from a machine gun even with a flat trajectory. However, the machine gun has immense superiority in offering only a low target, of requiring only one man to serve it, to move it vertically and horizontally, and to completely cover the ground with an uninterrupted fire, which is a very great advantage having regard to the suddenness of attacks.

The machine gun is unquestionably more mobile and is lighter than the field gun. Whether it be on wheels as in Germany, mounted on horses as in Switzerland, or on mules as in France in certain units, it can be transported anywhere. Our companies follow cavalry regiments over any country, at any place, and across all obstacles. On account of their mobility and lightness they can pass through woods, climb hills, descend steep places, and cross ditches and hedges; and they have the advantage of speed over infantry. When necessary, machine guns can be drawn, hoisted, or carried anywhere. A machine gun when carried on a pack-saddle can be got into action in 1, 1½, or 2 minutes. The German machine gun on wheels can open fire, without unhitching, in 7 or 8 seconds after the order has been given. Lastly, the machine gun does not occupy an extended front. Thus 8 machine guns would occupy the same front and offer the same target as 100 riflemen or a battery and would be hardly visible, besides having eight or ten times more firing efficiency.

The enormous importance of estimating distances and the difficulty of getting the range is one point of indisputable inferiority which the machine gun has as compared to the

field gun. The weapon must be laid very accurately in order to attain great precision. Whereas the 70 per cent dispersion of infantry fire reaches at moderate distances a depth of 150 meters and at great distances 100, the 70 per cent dispersion of projectiles thrown from a machine gun does not exceed 20 to 50 meters, so that in case of an error in the rear sight the projectiles fall either short of or beyond the target.

II. THE TACTICAL USE OF MACHINE GUNS.

The utility of the machine gun and its approximate value as compared to the field gun having now been established, we will proceed to consider where, when, and under what conditions we may be called upon to oppose this weapon.

Much of the literature, pamphlets, and newspaper articles, which discusses the tactical use of the machine gun is unquestionably inspired by advertisement. Competition is open, important interests are concerned, and each one puffs his own goods. Neither the task, the mission, nor the situation in which machine guns may be the safety of the country is taken into consideration; it is put forward as a *deus ex machina* which has come to save the honor of the army and give it victory.

Apart from these publications, one nevertheless meets with the most divergent, sometimes contradictory, opinions, and it is only actual war experience which can furnish the true solution. It is certain we may be called upon to fight against machine guns employed under very diverse conditions.

It is not within the scope of this article to go deeply into the tactical use of machine guns; still less to submit to a critical examination the opinions expressed on this subject. It will suffice to quote one or two passages from recognized authorities.

Boguslawski: "It is only when acting on the defensive that infantry can hope to find much assistance from this weapon. One of the reasons which greatly lessens the value of the machine gun in an attack is that when unprotected by any special breastwork it presents a more vulnerable target than riflemen lying or kneeling down—drawbacks which increase as the range diminishes. In short, it must be admitted that the machine gun can not be usefully employed in attack."

Captain de Monbrisson (cit. Lieutenant Campana): "It is in accompanying the attack that machine guns will be most usefully employed. The heavy guns will be very vulnerable in the zone of musketry fire, and the least accident to its team will stop it or cause damaging delays. On the other hand, a light machine gun, carried by its own gunners, could, by making use of all the inequalities of the ground, be brought almost under the nose of the enemy. Its great mobility also allows of its arriving on captured positions in order to hold them until the order of the infantry has been reestablished; it will act on the enemy like a multiple rifle and requires only a few men to serve it."

On the other hand, while the extraordinary mobility of machine guns is recognized on all sides, Lieutenant Parker, who commanded a detachment of machine guns in the attack on Santiago de Cuba in 1898 and who has published a very interesting pamphlet on his experiences, says: "Practically, therefore, they will not be carried in the first line, but will remain under cover waiting a favorable opportunity. They will change position as seldom as possible, because, as in the case of the field gun, the great difficulty is to find the range."

It is hardly possible to reconcile such contradictory opinions; we must keep to the main lines.

(a) MACHINE GUNS ACTING INDEPENDENTLY.

The writers in whose opinion machine guns should be regarded as a fourth combatant arm and who advocate in a general way the creation of units of independent machine guns are a small minority. The greater number regard the machine gun as a complementary weapon—a reinforcement or support to other arms.

However, Lieut. Col. Felice Mariani, professor at the Turin War College, who has made a special study of machine guns and their use, imposes this essential condition—that they should form special troops and that the units, whether of infantry or of cavalry, should be under the immediate orders of the general of division. This opinion has been indorsed by the Military Society of Rome, to whom it was submitted.

Lieutenant Parker in his pamphlet, which has already been quoted, relying on the experience already gained in the Cuban war, also advocates the constitution of independent batteries,

because the greatest liberty of action and the most complete initiative should be allowed officers commanding machine guns.

Finally, the Swiss regulation, on page 27, reads: "The general officer commanding *may* detach machine guns from the cavalry and give them any special task which demands great mobility and firing strength. In case he should do so he must give them a special support (cavalry, bicyclists, infantry in wagons)."

In short, it is not impossible that our infantry may have to fight subdivisions of independent machine guns.

(b) MACHINE GUNS AND CAVALRY.

It is no longer questioned that machine guns are of considerable importance to cavalry. It is agreed that machine guns can play the part of mounted artillery; but they also have other duties and a rôle of their own. "The duty of machine guns carried on horses is to second the cavalry in all it undertakes and to facilitate the solution of its task." (*Projet d'Instruction pour le Service et l'Instruction de la Cavalerie Suisse*, 1903, p. 351, No. 5995). "Machine guns are attached to cavalry for the purpose of increasing the effective firing strength of the cavalry." (*Règlement Suisse sur les Mitrailleuses*, 1900, p. 125).

The German drill regulation (May 14, 1902) assigns a special duty to machine guns in a fight between cavalry and cavalry. Boguslawski develops the idea that machine guns are destined on account of their firing power to render first services in attacks of masses of cavalry in flat country.

In Switzerland experience has led to a different utilization of machine guns. One of the essential qualities of machine guns is mobility; another advantage is the smallness of the target they offer, which makes it difficult to locate them. They will therefore be essentially employed for surprise attacks by fire. Attached to independent cavalry, machine guns aid them in carrying out reconnaissances; left and right, like troublesome flies, they harass the enemy's columns in order to force them to deploy and to show what they are or stop them in their march. Or else they make a frontal attack while the brigade attacks them on the flank. Or, again, they close the way to them and oblige them to make a de-

tour, in the course of which they will take up a fresh position to harass them again. Mobile as the cavalry they accompany and with which they cooperate, they should never hinder or stop them, should be quicker even than they, stinging the enemy left and right, sweeping round him, only appearing to disappear, then reappearing in another place.

On the other hand, when independent cavalry playing the part of mounted infantry are sent to occupy a line or hill until the arrival of the infantry, the machine guns will be placed in line with the carbines. They will also be of great service to cavalry in pursuing an enemy or covering a retreat. During battle machine guns will cooperate usefully with the operations of the cavalry on the flanks and the rear. In all these different circumstances and in all these cases, which will probably be the most frequent in view of the tendency to attach machine guns preferably to cavalry, the infantry will find themselves opposed to machine guns, sometimes inclosed in a line of cavalry, often detached, but always supported at a greater or less distance.

(c) MACHINE GUNS AND ARTILLERY.

Machine guns can be attached on the battlefield to the artillery supports, the strength of which can thereby be reduced. When placed in front or on the flanks of the batteries they can assist in repelling an attack without the guns being obliged to go to the defense of the flank and momentarily interrupt their fire against their principal objective. The daily journals have recently reported the obstinate defense of the Russian machine guns supported by artillery, which ended by their being taken by the Japanese at the battle of the Yalu. Some writers have even proposed to permanently attach one or two sections of machine guns to each group of artillery. (*Revue d'Artillerie Juillet*, 1900, p. 287, note.)

(d) MACHINE GUNS AND INFANTRY.

Special employment.—In a certain number of cases we may expect to have to attack machine guns where undoubtedly they would fulfill the functions of infantry to greater advantage than infantry itself. Such cases are:

(a) Where steady, well-delivered fire is necessary, but where the cramped surroundings prevent the deployment of a unit

of some importance: in mountainous countries in order to attack lines of communication, defiles, paths, bridges, fords, roads inclosed between rocks and precipices, debouches from villages, forests, etc.

(b) Where the enemy must be attacked by fire, when shock tactics are not indispensable and when only a few men can be detached or employed: outposts, main-guards, flankers, advance guards, etc.

(c) Whenever it is necessary to make a rapid attack at a certain distance by fire: machine guns attached to the advance guard charged with occupying and holding a line before the arrival of the main body, insuring crossings, forcing the enemy to deploy, etc.

(d) Whenever it is desired to surprise the enemy and create a diversion: attack on the wing or on the flank; or when an attempt is to be made to crush him unexpectedly.

General employment.—Machine guns are destined to be of great service when acting on the *defensive*, either for occupying points from which the foreground can be swept or for flanking fire. They will also usefully support counter attacks by their fire.

For *offensive* attack two possible uses for them can be foreseen, although both are disputed. One is where machine guns are inclosed in the line of fire, directing their fire against deep and extensive targets, against principal points of attack, against the point aimed at by the infantry for their assault, etc. The other is where machine guns occupy a position in the second line, firing over the first when it advances, continuing firing while it marches, and capable, if necessary, of being used as a support and entering into the line of fire. After having paved the way for the assault they would throw themselves in the enemy's position with the assaulting troops in order to follow up with their fire, or they would cover a retreat in case of defeat.

III. WITH WHAT ARMS SHOULD MACHINE GUNS BE OPPOSED?

In the preceding chapters we have demonstrated the qualities and deficiencies of the machine gun, and we have pointed out the circumstances and the situations in which we would encounter it.

Before discussing how infantry should oppose machine guns it is important to ascertain if infantry alone would have to be relied on or if any other combatant arm could assist the infantry.

(a) MACHINE GUNS AGAINST MACHINE GUNS.

Whereas infantry, cavalry, and artillery fight essentially weapon against weapon and mutually try, above all things, to crush one another, machine guns can not advantageously oppose each other. Their objective is a broad or deep target; they can not be used against such an imperceptible target as they themselves present.

(b) CAVALRY AGAINST MACHINE GUNS.

With their swords a squadron of cavalry would have but little effect upon detached and mobile subdivisions of machine guns; cavalry would offer them an excellent target. On the other hand, cavalymen armed with carbines move rapidly from point to point, and from under cover near the machine guns can by means of a few bullets render the position untenable for the enemy's gunners. Cavalry under these conditions therefore fulfill the rôle of a very mobile infantry patrol.

(c) ARTILLERY VERSUS MACHINE GUNS.

Directly machine guns expose themselves to view within range of artillery, their position becomes untenable. But the great difficulty will be for the artillery to see this target. If the machine guns succeed in creeping up to within a short distance under cover, there are many chances that their rapid fire would cause great damage before the artillery should discover them and get the range to fire upon them.

The infantry, therefore, must count chiefly upon itself, and usually upon itself alone, to combat the machine guns, at least at ranges below 1,500 to 2,000 meters.

IV. FIGHTING BETWEEN INFANTRY AND MACHINE GUNS.

(a) MACHINE GUNS PLACED IN LINE OF DEFENSE.

As has been seen, the machine gun, because of its range and the precision of its fire, would be of particular advantage in occupying defensive positions. Called upon to sweep open

spaces with their fire, to render important points inaccessible, or to cover the flanks, they would be most formidable, especially as they would be covered and masked and therefore difficult to see. If the enemy's artillery slackened fire, the attacking artillery could, if it succeeded in discovering the emplacement of the machine guns, inflict serious losses on them. The attack on Romont by the first division in the maneuvers of 1903 may be quoted as an example. Romont was occupied by 2 battalions of carbiniers and 4 machine guns, and was attacked by 4 batteries of divisional artillery and 3 batteries of corps artillery. One of the groups of divisional artillery immediately and properly directed its fire on the machine guns which were detached on the side of the hill; the other batteries fired on the infantry.

At the battle of Avry-sur-Matran the machine guns of the maneuver division were on the same line as the artillery, but at the wings, and were attacked by the infantry. The attacking batteries were superior and concentrated their fire on the opposing artillery. The machine guns were intrenched and therefore invisible, only their rattling noise betrayed their presence. The infantry of the first division, which were in very great numerical superiority, kept up a hot fire on the debouch from the wood along the whole front at a favorable range. It is not probable that under so hot a fire the position would have remained tenable for long. But if, instead of the ground being broken, wooded, and favorable for the attack, it had been an open plateau or a long glacis rising from the plains, as for example, at Vuarrens (first day of maneuvers) or at Poliez-Pittet (second day) the infantry would have been in a more difficult position and would not have dreamed of advancing as they did at Avry-sur-Matran.

Similarly, when machine guns are inclosed within the infantry, thus preventing their being surprised on the flank, as may be done when they are detached, there are but two measures to be taken.

(a) The attacking infantry, directly they arrive at such a distance from the enemy's position that the machine guns can usefully open fire, say at 1,500 or 2,000 meters, should take up suitable formations. These formations are dictated by the qualities of the machine guns which seek for deep targets and lines on the same plane, which they can sweep with fire

from one end to the other; besides, as has been pointed out before, on account of their precision of fire and small dispersion, the machine gun has difficulty settling the range. The infantry, therefore, should deploy and not offer long lines on the same planes. A company should advance in four lines of sections in échelons or checkerwise, each section completely deployed; they should advance by rushes, appearing and disappearing, so as not to give the machine guns time to see them and get their range.

(b) It is only within firing distance and when the exact emplacement of the machine guns has been ascertained that they should be actively attacked; and there is only one method of doing this: Immediately they come into action and are usable, a hail of projectiles should be fired upon them and the magazine fire concentrated upon the gunner working the machine gun, so as to place him *hors de combat* or make him lose his nerve.

The political journals of the month of May reported that at the battle of Orikokorero, the Herreros sought to capture a machine gun which the Germans were using. On two occasions the three men in charge of the gun were struck down by the enemy's fire, but were each time immediately replaced by soldiers detached from the line of riflemen. Marine-Lieutenant Hermann, who commanded the artillery, having been wounded in the side and shoulder, and being only able to move himself with great difficulty, finally gave the order to withdraw the machine gun. Two horsemen tried to carry away the gun. It was badly damaged and no longer capable of being worked. They had hardly gone a few steps when both fell, struck by bullets from the Herreros. The machine gun finally remained in the hands of the enemy.

At the battle of the Yalu on the 1st of May, 1904, on the extreme left Russian wing, the machine guns which, with some infantry and Colonel Mourawsky's battery, occupied the extremity of the position, remained in the hands of the Japanese infantry of the Twelfth Division, notwithstanding the fact that according to General Kuropatkin's report they had fired 35,000 rounds.

At the battle on the heights of Auvours (January 11, 1871), one of the rare occasions when trench machine guns were employed as they should be, they actually had them attached

to the artillery and they remained useless, their range being too short. Three American Gatling machine guns had meanwhile been pushed in front of the artillery and occupied the loop-holed wall of the ancient park of Yvré. The German Great General Staff publication (v. 4, p. 817) mentions the necessity there was for putting these machine guns *hors de combat* before making any attack. All the efforts made by troops in great numerical superiority were useless.

Lieut. J. Campana, in the study which he has made of this day,^a concludes in these words: "So a Prussian army corps was held in check for a whole day by a French division; they could not break through the enemy's lines, although he had no infantry. To what was this result due? To the artillery, and especially to the machine guns, of which the greatest possible use was made, the guns being under shelter and the distance not exceeding 1,500 meters."

(b) INFANTRY IN POSITION ATTACKED BY MACHINE GUNS.

Let us reverse the rôles now and discuss the task of infantry occupying a position attacked by troops with machine guns, admitting with certain authors that machine guns have a part to play in the offensive.

According to what has already been said, there are two principal methods of utilizing machine guns in the offensive: either in the line of fire, so as to reinforce the firing power of this line, or in a second line, either as a reserve to be directed on weak points, or as a second échelon of fire which could shoot while the first échelon advances, thus creating a diversion.

1. The machine guns advancing with the line of riflemen and being able to shoot with success a very much greater distance than the infantry, it is obligatory for the defending troops to hasten to occupy their intrenchments or their line of fire, whatever that may be. The presence of machine guns imposes three special obligations: Lines of men's heads aiming and firing all together must never be exposed, as they could be mowed down in a few seconds. Consequently the men must fire independently consecutively; lines or groups of reserves, forming a broad or deep target which is just what

^a *Bataille du Mans, Revue d'Artillerie*, July, 1900, p. 297.

machine guns want, should never be allowed to be seen even for a few seconds; finally, the flanks should be closely watched.

Some examples will illustrate these three rules.

In 1882, near Tel-el-Kehir, on the banks of the fresh-water canal from the delta of the Nile, a battery of English Maxim guns extinguished in a few minutes the fire of the Egyptians in their intrenchments. The Egyptians ran away, and the English troops found the trenches filled with the dead; this was the work of a few moments. On the other hand, Captain Braun^a remarks that "if the Maxim machine guns played a relatively unimportant part on the English side in the South African war, this was entirely due to the Boer tactics, to their scattered lines, and to their irregular fire."

This same war offers an example to the contrary; we have but to exchange the scene. At Spionkop, concentrating their fire on a plateau 900 meters wide and 1,500 deep, where 6,000 English were massed together, the machine guns contributed most remarkably to the Boer success. It was a veritable hail of iron and stones. The bullets literally scored the ground, where in vain the soldiers of General Warren lay flat on the ground, while Captain Gilbert continued to crowd up his men on insufficient ground and to increase the number of his rifles, where their places could have been much better filled by a machine gun, which would have done as much work as 100 rifles and have taken up much less space. And further on he says: "Machine guns would have been a hundred times of more value to check the Vickers-Maxims of Botha." We do not believe this last assertion, but we do consider that the large targets which the English offered to the machine guns facilitated their destruction.

Lieutenant Parker cites some analogous cases in his review of the attack of Santiago de Cuba:

"At 1 o'clock in the afternoon I received (July 1, 1898) from General Shafter an order to give one of my guns to Lieutenant Miley and to carry the others (three) forward on the line of fire, and to come into action on the position which I might judge to be most favorable. I carried out this order; I gave up one of my guns and carried the others at a gallop beyond the ford to a position which I had already chosen. I opened

^a *Das Maxim Maschinengewehr und Seine Verwendung*, Berlin, 1903.

fire simultaneously with my three Gatlings at a quarter past 1 o'clock, at ranges varying from 550 to 700 meters. The enemy at first concentrated their fire on us, then shortly their fire diminished, and at the end of five minutes they leaped out of their trenches and ran. We fired as rapidly as possible on the men thus exposed. I ceased firing at 23 minutes and 30 seconds past 1, when our assaulting troops arrived to within 150 meters of the enemy's trenches. The infantry and cavalry had failed for two hours to take this position; it fell into our hands eight minutes and a half after the Gatlings had opened fire.

"Toward the end of the fight one of the town batteries sent some 16-centimeter shells against my two pieces. I opened so brisk a fire upon them that the gunners had to leave their battery. It is probably the first time that a gun of this caliber has been silenced by machine guns. The range was about 1,800 meters. * * *

"We directed a very hot fire (4 Gatlings, 2 Colts, 1 dynamite gun) on the battery of 7 guns, situated about 1,400 meters from us, every time the enemy tried to fire them. This battery was only able to fire three shots after the 4th of July."

Everything that is not masked, all lines or groups, should never be exposed to the fire of machine guns, as they offer too good a target for them.

As far as flank attacks are concerned Captain Braun claims that during the first half of the Transvaal war the Boer machine guns tried to surprise the flanks of the English lines and often succeeded.

At the Swiss maneuvers in 1903, at the time of the battle of Chapelles (third day), just when the Second Division from Aillérens were making their counter attack, the machine guns of the First Division very rapidly and skillfully came out of the woods to the north of Martherenges to flank this counter attack; they succeeded in turning part of the troops sent to repel the assault. A detached patrol on the flank of these troops forming the counter attack would have been sufficient to silence the machine guns.

At Poliez-Pittet (second day) the battalion of carbineers in the defense of Chalet au Renard gave an example of maneuvers from which useful information may be drawn. Learning of the proximity of cavalry with machine guns on the extreme right flank of the First Division, the flank which

this battalion had to protect, the commanding officer took up a position and held his men in readiness. He repulsed a first attempt to attack on the part of the cavalry, then an hour or two afterwards, his battalion being always ready to fire, he succeeded, by a hail of bullets from one subdivision, in stopping the machine guns which were trying to take up a position to support a second attack on the part of the cavalry. It was an affair of only a few seconds, because one minute more or less according to the system is sufficient to get a machine gun into action. It is always necessary to be ready to fire, to have the distances marked with great exactness, and to keep a careful lookout. The chief thing is to prevent surprise.

To sum up, when an attack is made by a line of riflemen provided with machine guns, double precautions should be taken, efforts to hit the machine guns while they are being got into action should be made, and a crushing fire concentrated upon them.

2. According to other authorities, machine guns should not, while acting on the offensive, follow the leading troops, but should remain in the rear in order to support these troops by their fire while they are advancing and can not fire themselves. As long as the machine guns, playing this part, are at a great distance, only the enemy's artillery can attack them. When they are nearer, as fire draws fire, the infantry should never forget and neglect the lines which are advancing, in order to direct all their fire at the more distant machine guns. It is difficult to lay down a law; the general rules in articles 257 and 259 of the drill regulations for the Swiss infantry should be adhered to.

"Fire should be directed against those troops which have the greatest bearing on the battle and which contribute most to its result. * * * In some cases it may be necessary to direct the fire of the whole subdivision on certain targets * * * and only when the circumstances shall insure a result proportionate to the number of shots fired." In this estimate of chances the fact that if the target offered by machine guns is small, one bullet is sufficient to put the man serving it *hors de combat*, should be taken into account.

(c) **MACHINE GUNS AND INFANTRY IN CHANCE OR UNFORESEEN BATTLES.**

As we have already stated, it is to the cavalry especially that machine guns should be attached. The divisions or brigades of independent cavalry should also be provided with them, as should also the squadrons attached to the advance guards and the battalions of advance guards themselves. However that may be, it is very probable that the first contact of troops marching to meet each other will be made by means of machine-gun fire.

(a) A digression is here necessary. In reality a direct collision between infantry and the machine guns of an enemy's advance guard is not likely to happen. It is more probable that both columns would be preceded by cavalry. Let us consider the duty of this divisional cavalry when it finds itself in front of machine guns or in a district infested with groups of machine guns ready to fire from all sides in order to harass and retard the principal column.

Let us take an example. The first day of the fight between divisions at the maneuvers of 1903 the 8 machine guns attached to the second division joined to the regiment of cavalry 2 stopped and took up a position on the heights to the north of Echallens and were held off by some squads of dismounted dragoons who were defending the bridges of Echallens. The remainder of the regiment of dragoons of the first division had gone round the machine guns and continued their scouting operations toward Vuarrens-Yverdon. One might here ask if this was wise. But when the company of guides 1, preceding the infantry columns, hurled themselves on these machine guns they did not think of making any special disposition. The machine guns were therefore able at a great distance to take two columns of the first division in enfilade under a fire which would have been crushing. The same criticism applies to the leading company or companies. What did they do? They continued to advance under a hot fire at a distance from which they could not reply. Then they deployed and opened fire. Such an unequal fight should not, in our opinion, have been undertaken, but it was necessary at all costs to open the road to the infantry which was advanc-

ing by forced march in order to arrive first on the crest of Vuarrens.

Machine guns prefer a broad and deep target. The infantry should have dispersed into patrols and disappeared. Machine guns being very mobile, move from left and right and change their position easily. The dispersed patrols therefore should cover the country and should creep about everywhere, so as not to leave the machine guns a single point where they would not be in danger. Once a patrol is within 400 or 500 meters of it the machine gun is no longer safe; in fact, the time necessary to dismount it, load it, and go off with it must be counted. A united company can not accomplish this task. It is only numerous and active patrols crawling along the front or creeping up to the wings who can do it. One well-directed shot is sufficient to put a machine gun out of action. One good marksman within a reasonable distance can himself gain the necessary result. We would like to see in a similar case the advance-guard cavalry leave their horses and, carbine in hand, make a dash with the boldness and activity which characterizes them to clear the ground of the enemy.

If for one reason or another the cavalry could not accomplish this task, the leading company should at the first shot from the "mower of men" suddenly vanish, dissolve into patrols, and harass those groups which are themselves thinking only of harassing. Let us take the example of Echallens. The independent cavalry, the divisional cavalry, and the leading company follow these tactics. The first avoided the 8 machine guns; the second and the third deployed to the front. On account of the distance these 200 rifles were unable to prevent the hail of bullets from falling by *rafales* on the columns of the first division who continued to advance and threw company after company into the line of fire, and it was only when 6 companies had been deployed on the front and 2 on the left flank of the machine guns that these latter packed up their baggage and retired. It is very probable that during the quarter of an hour this deployment lasted the columns would have been overwhelmed. What ought they to have done? We have already said, "Make the target disappear and send patrols in all directions." In other words, place those of the first battalions of the columns of march who are within 2,000 meters of the machine guns under cover or make them lie

down and throw out patrols of subofficers in all directions. What is the good of detaching a company which is less easily managed and less active than a patrol, which offers a target which can be seen and fired at from a great distance, when a few good rifles can effectively accomplish this task?

In our opinion all forward movement in line allows machine guns to keep up a sweeping fire, against which the enemy is powerless so long as he is at a great distance and is not certain of the emplacement of the machine guns. If the ground permits of groups advancing by crawling and of arriving within a short distance for the purpose of surprising the machine guns in front, these latter will be obliged to hastily retreat; but they will only do so to reappear at another point. We have compared machine guns to persistent and annoying flies. A veil of patrols must be used to keep them at a distance like a mosquito-net.

(b) This leads to the reply to the question very frequently discussed of the number of troops to be deployed against machine guns. It has often been sought to solve this question by calculating, as was done in the first part of this paper, to how much fire one machine gun was equivalent. Thus the umpires officiating to the north of Echallens estimated one company per machine gun. The next day to the north of the Chalet du Renard this estimate was reduced to the extent of one section. This sort of calculation appears to us to be a great mistake. The machine gun can only usefully direct its fire on a large target and at a known range. It must be taken at its weakest point and only a small target at a short range offered to it.

When on account of the nature of the ground it is impossible to send patrols on the flanks, an advance on the front should be made; but this advance should follow the method of the Boers—viz., by groups or sparsely scattered men; never in line or in column. The distance to be traversed will never be very great, since the fire of machine guns is not effective beyond 1,800–2,000 meters, and when rifles are within 500 meters the situation becomes too dangerous for them.

The aim of machine guns is to surprise. They profit by the disorder which they produce and by the momentary embarrassment of their adversary, who does not know where to locate them. The commanding officer wants half a minute to

find his bearings and throw out his patrols. In half a minute 300 bullets may decimate his troops. He can not fight, not knowing where his enemy is. He must therefore concern himself with getting his men under cover and, without losing a second, give the order to "Lie down" and conceal his men in the ditches along the road or in the furrows in the field.

The method of "**forward** in spite of everything" has been defended and sustained by saying that the first troops should be thrown forward with a dash on the enemy, and the road in this way opened. If many were hit, there would still remain enough to drive off the machine guns.

This method is only applicable in exceptional cases, such as where machine guns occupy a position along the front or along the flank barring a road and where the location of the enemy is known. In this method the difficulty of finding the range is also taken advantage of.

This solution, although attractive, is singularly rash. It must not be forgotten that the fight is with unequal arms and that at distances below 1,000 meters the trajectory becomes flatter and flatter and the zone of danger considerable.

This rashness will probably cause a crushing defeat, and even if the machine guns were driven off they would soon reappear at another point.

(c) After contact with the advance guards the machine guns must display their principal activity on the wings, and it is there that an effort must be made to crush them by fire before they have found the range and got into battery. Wherever they appear during the battle they must always be regarded as "the troops having the greatest importance" (Drill Regulations, Art. 257) and must be subjected to a concentrated fire, such as the Herreros inflicted on the Germans in the case quoted above.

Finally, the part played by machine guns must not be exaggerated, and it must not be supposed that the infantry have anything great to fear once the battle has begun. In a report made by an English subofficer temporarily in charge of a Hotchkiss he states that during the Transvaal campaign his machine gun took part in 27 fights, but that in 23 of them it fired less than 600 rounds. During the days of the hottest firing not more than 1,000 rounds were fired. During sixteen

months of uninterrupted firing it fired 10,370 rounds. It seems, therefore, that machine guns have less occasion to enter into line than one would imagine at first sight.

(d) SPECIAL MISSIONS.

Infantry will frequently be thrown against machine guns in cases where the configuration of the ground allows the deployment of troops and the alignment of a sufficient number of rifles: mountain fighting, defiles, (bridges, fords, etc.,) local fights, street fighting; so, also, in partisan warfare and in ambuscades where surprises are possible.

(a) *Mountain fighting*.—Machine guns could be equally as well employed in the offensive as in the defensive; in fact, in 1895, when Chitral, not far from the frontier of Afghanistan, was threatened by the fanatical mountaineers of Hindoostan, the few English machine guns distinguished themselves. The taking by assault of Malakand Hill was only made possible by the preparatory fire of the machine guns. These, carried on mule back, were hoisted onto a rock flanking the hill, which they swept by their flanking fire at 1,400 meters. The assaulting troops found heaps of dead.

The acknowledged tactics of mountain warfare holds good. A detachment of flankers should be sent to envelop—that is to say, to advance on the flank and to get near enough to the machine guns to be able to fire on them effectively while the main column is advancing by the main road. Certainly a machine gun masked behind a rock, commanding a defile by its fire, occupying a hill, covering a road or a path bounded by a precipice, is in a very advantageous position; but inasmuch as it may be endangered by a good marksman on the flank that position may become untenable. According to the ground and circumstances these flankers may be able to harass the gunner or to put him *hors de combat*, thus temporarily interrupting the fire. The main column, or at any rate its advance guard, will take advantage of these intervals in order to make a forward rush.

It may be said that in mountain warfare, when a machine gun is not free to move about as on the level, one rifle in front and one on the flank acting in correlation one with another are theoretically sufficient to thwart a machine gun.

It is not always possible to execute an enveloping movement; for instance, in an inclosed valley, in a gorge, and other similar cases. An advance must then be made on the front; but in this case it is useless and dangerous to send a column or massed troops forming a target; but a patrol should advance by creeping along the ground, taking advantage of every opportunity to make a few steps forward or on the flank and of getting in a well-aimed shot to put the gunner *hors de combat*, and thus allowing 100 meters to be gained while he is being replaced.

In the case of infantry occupying a hill attacked by machine guns they should guard their flanks very carefully by sending out patrols on each side and forward in order to prevent these engines of war from taking up a position at a favorable distance from the hill.

(b) *Defiles*.—As regards bridges, fords, dikes, or roads traversing marshes and other defiles a distinction must be made. If the machine gun has approached the defile itself, a line of scattered riflemen having advanced under cover should direct a concentric fire on it and on its escort (cyclists, infantry, cavalry.) On the other hand, if it is in position at a certain distance beyond the defile, which it is sweeping with its fire, say 1,000 meters, for example, the situation is more complicated. In this case artillery would be very useful; but if the infantry alone has to accomplish this task, which is to clear the defile, it is again, as it seems to us, patrols or sparsely scattered men who should be sent to carry out this work.

(c) *Local fights*.—We may expect to see machine guns largely employed in defending the exits from villages or from woods or for attacking these points. In such cases either concentrated fire or an enveloping movement by patrols would be possible, it being understood that the riflemen could advance between the houses or the trees.

When it is a question of defending water courses, it would almost always be possible to send one or two patrols beyond the water.

(d) *Special missions*.—As has been pointed out before, we may expect to see machine guns frequently employed in those cases in which sufficient men cannot be spared to obtain the desired result by rifle fire. This would arise in affairs between

advance posts, main guards, advance guards, rear guards, or flank guards. On these occasions machine guns would always be inclosed by infantry (if necessary, brought to the front on carriages), by cyclists, or by horsemen. They should be protected and supported. The duty of infantry sent against these troops in order to overcome them and open up the road would lie in attacking the whole detachment and firing along the whole line as well as in directing the concentric fire of specially designated units on the machine guns. The division of the firing in these cases is important.

In the pursuit against an enemy who has machine guns in his rear guard it would not be the infantry, but more particularly the cavalry, who should send patrols, carbine in hand, on the flank to dislodge them.

V. CONCLUSIONS.

Finally, we should like to sum up the few general principles which it appears to us should inspire the tactical decisions of an officer commanding troops of infantry who have to fight against machine guns:

1. Machine guns seek wide and deep targets. Infantry should therefore advance against them in scattered and broken lines and on different planes.

2. The effect of machine guns is terrible; but the small diffusion of the projectiles (70 per cent; 20 to 50 meters at moderate and great distances) gives a very great importance to the finding of the range. The infantry should therefore take advantage of the moment necessary for the correction of the estimate of the range, in order to get under cover or disappear until the machine guns have been driven off.

3. The machine gun is worked by a single man as gunner; one bullet is sufficient to put him *hors de combat*. It is therefore useless to expose a great number of men when a patrol is sufficient to accomplish this.

4. As machine guns require about a minute to pack up and be off, they can not withstand the presence of rifles within 500 meters. It is therefore the duty of patrols to advance as rapidly as possible to within this distance.

5. Machine guns can be moved about very rapidly and easily. A single patrol is therefore insufficient. A large

number of them must be thrown out throughout the whole country where the machine guns may be expected to take up new positions.

6. When machine guns are inclosed within a line of fire or when, on account of the configuration of the ground, it is impossible for the patrols to get near them, a concentric fire from certain designated units should be directed against them and advantage taken of the moments necessary for changing gunners or of intervals in the firing in order to make forward dashes.

7. Artillery can at great ranges be a very great help to infantry attacking machine guns which are in position and in sight.

USE OF MACHINE GUNS IN THE DEFENSE OF A PERMANENT FORTIFICATION.

By Lieutenant of Artillery DOTHEY.

Translated for the Second Division, General Staff, U. S. Army, from the *Bulletin de la Presse et de la Bibliographie* (January 31, 1903,) by First Lieut. WALTER G. PENFIELD (U. S. Infantry), Ordnance Department, U. S. Army.

At the present time machine guns are attracting more than ever the attention of military students, the efficacy of their fire constituting an important element of success. It is generally believed that in future wars they will play an important part on the field of battle and that the leader who knows how to skillfully employ them will possess a marked superiority over his adversary. Following the results obtained by their employment at Santiago de Cuba, certain writers have even predicted that machine guns will mark an epoch in the revolution of tactics.

However, in spite of the many advantages which they possess and which are almost universally recognized, many countries still hesitate to adopt this new material on account of the great difference of opinion which exists on some important points of organization and tactics. The most important of these points being—

(a) Should the machine guns be added to the infantry (to the battalion, the regiment, or brigade,) to the cavalry, or to the artillery?

(b) Should they form an independent arm?

(c) How should the batteries be organized?

(d) Would it be preferable to employ them on the offensive or on the defensive?

(e) Would they be able to advantageously combat with artillery and in case of need replace some field pieces, etc.?

Although very interesting, these different questions are not the object of this paper, which has for its aim the discussion of the advantages which would result from the employment of

machine guns in the particular case of the defense of a permanent fortification.

It is known that the defense proper of an isolated permanent fortification can not be made exactly similar to that of a defensive position protected by hasty intrenchments on the field of battle. The design of a permanent work will not permit the execution of a counter attack at the moment when the assailant is stopped by the accessory defenses and by the fire of the defenders. The defense of a fort is passive, as it is built solely for defense, and relies entirely upon the effects of its fire. If we require of the infantry, who will assist in the defense, simply to deliver a steady and well-directed fire, we will then lose the most valuable quality of this arm—namely, its mobility—and in consequence its offensive power. It would therefore appear that a more judicious employment could be made of this arm if it should be replaced on the emplacements by machine guns and then to make such dispositions of the infantry outside of the fort as would enable it to execute the counter attack at the instant when the fire of the machine guns have caused the enemy to hesitate, and thereby stop his advance.

At first the very thought of a fort fighting without infantry is appalling. It is a condition quite contrary to all modern ideas. However, in order to calmly consider these things, the following may be assumed:

First. Every position ought to be protected by some defensive means which is particularly appropriate to the nature of the defense which it demands.

Second. Every fort is a defensive position, requiring for its interior defense only a passive arm capable of furnishing a fire of great intensity.

Third. Infantry is endowed with active qualities, which can not be utilized in the passive defense of a fort, while machine guns possess all the passive properties necessary for this defense. Logically, then, the latter could be used equally well.

Not only will the machine guns fulfill this special mission as well as the infantry, but as weapons for a passive defense they are even superior. It is well known, in fact, that machine guns give a greater accuracy of fire than infantry and in addi-

tion have a greater effect on the morale of the attacking forces.

Some figures will assist in establishing the first point.

Comparative experiments made at Aldershot, England, with Maxim machine guns and rifles gave the following results: At 75 meters 15 riflemen executed "fire at will" for 3 minutes and 40 seconds. They made 41 per cent hits. At the same distance one machine gun made 80 per cent hits in the space of 1 minute.

In Austria some experiments have been made to especially determine the effect of fire on close formations of infantry. In a series of shots at short range executed with different arms, among them 20 rifles on rests and 2 machine guns, the best results were obtained from the latter.

The results of some experimental firing in Switzerland with machine guns show that on a foggy day and at a distance of 1,550 meters a field battery, of which 4 pieces were scarcely visible, lost 67 per cent of its personnel in 3 minutes and 40 seconds. It should be noted, however, that in this experiment for economical reasons the maximum rapidity of fire (600 shots per minute) had been reduced more than one-half.

In reviewing these experiments made in Switzerland, a German military journal asserts that the fire of a single machine gun is proven to be equivalent to that of 100 rifles.

As a result of study and experiments Captain de Remier, of the French army, concludes that a battery of six machine guns is equivalent to three companies of infantry, and that, moreover, at 2,000 meters the machine guns fire with a remarkable accuracy.

Comparative tests made in Russia have demonstrated:

First. That one machine gun is equivalent to 50 trained riflemen.

Second. That at 800 meters it produces the maximum effect and that beyond 800 meters it will do as much execution as two field pieces throwing shrapnel.

Lieutenant Benson, of the English artillery, gives the following value of machine guns considered from the point of view of fire:

First. By reason of their rapidity of fire they are able to obtain in less time results superior to those of other arms.

Second. The change of objective is executed almost instan-

taneously and without interruption of fire. It is to be noted that the infantry possess this faculty to a less degree, for it is much easier to make one rifleman change his objective than to make a platoon of riflemen do so.

Third. They are able to fire continuously for a period of several minutes.

Fourth. Finally, their fire is more accurate than that of rifles.

The above conclusions were made in 1887. Since that date machine guns have been perfected and have several times undergone the test of war. Thus in 1893 in the campaign against the Matabeles the Maxim machine guns were employed with success by the English troops. On the 25th of October, writes the correspondent of the *Daily News*, a column of 4,000 Matabeles attacked the English camp. Although made with vigor, the assault failed before the fire of the Maxims, which cut down the enemy by hundreds. Also in the attack of a kraal occupied by the enemy the enemy were decimated by the fire of the machine guns and left more than 15,000 bodies on the field.

In its report on the battle of Omduran (September 2, 1898) the *Revue Militaire* of 1899 relates how that during the last attack the dervishes were seen to march to their death with fearlessness and extraordinary heroism. Their long white lines seemed to melt under the intense fire of the infantry and Maxims.

Finally, according to Lieutenant Parker, of the United States Army, at Santiago de Cuba in 1898 the Colt and Gatling machine guns played an important part, which was made the subject of special mention in the reports of the commanding generals. Lieutenant Parker does not hesitate to say that the results obtained around Santiago will mark an epoch in tactics, because they introduce a new arm which it will be necessary to consider in future wars.

The enormous superiority of fire of machine guns over that of infantry, considered from the point of accuracy only, being established, there still remains to be proven the second point—namely, that the new weapon exerts a greater demoralizing influence over the adversary.

The time of inaction which will elapse between the moment when the infantry ought to be shut within the fort and that

when they should appear on the emplacement, time of which no one is able to foresee the duration, will be to them extremely prejudicial. The fatigue of a wait of more or less duration in a bombarded fort will lower its morale. Assisted afterwards from the height of its fighting position by a view of the details of the conflict, both in the distance and near the fort, they will certainly lack that calmness which is indispensable in order to realize an efficacy of fire. The experiences of war have proven this fact.

Another cause of demoralization may arise which will be still more important. Considering the enormous advantage which an assailant may reap from an assault made against defenders who are unnerved and demoralized, a number of military writers have advised the following method: Cease the bombardment of the defensive point which is to be carried by storm so as to quickly draw the defense to his fighting positions, at the same time seeking to keep the assailing infantry out of rifle range. This result obtained, begin again quickly and violently the artillery fire in order to cause the defenders the greatest possible loss and oblige them to again seek cover. Stop again the bombardment in order to bring the defenders again on the emplacements, and repeat this process as often as is necessary. However admirable they may be, no troops will be able to resist the demoralization produced by such tactics. Under these conditions and when the decisive moment actually comes will it be possible to produce successful results with the 80 rifles of a platoon aimed at hazard at each shot. It is not the same with the machine gun. One very important point in its favor is that the gunner will be a chosen man, and as with his machine gun he represents many riflemen it will be necessary in order to equal him that all the riflemen whom he replaces should have his moral courage. Moreover, it should not be forgotten that the operator is well protected by the shield. In addition it will be easy to place the few operators of the machine guns under cover and protected from the demoralizations from the fire of successive bombardments, as explained above, while protection would be impossible for a company of 250 men. Finally, once well pointed, all the shots from the machine gun will be much more accurate than those of 80 riflemen, even if the latter are very calm.

In considering this subject it is interesting to compare the dispersion of the bullets fired by a line of infantry and by a 5.7 centimeter gun, with those from the machine guns.

With infantry, the bullets are distributed on a vertical plane in height and width so that the zone of hits takes the form of a lozenge. Experience proves that nervous men generally fire high, especially at short distances. In consequence the rectangle of distribution will be almost entirely above the object aimed at.

With the 5.7-centimeter cannon the results are a little different. At each shot the dispersion of the bullets follow the circumference of a circle and in a series of shots with angular displacement of about 7° the trajectories on a vertical plane will be contained in adjacent circles of a height much greater than the object aimed at. Under favorable circumstances the object aimed at may perhaps be thoroughly covered; but four-fifths of the shrapnel fragments are lost, which is a waste of ammunition. It is true that, as also in the case of infantry, projectiles fired too high may strike troops in rear; but it should be noted that the bullets of the 5.7-centimeter cannon totally lose their efficiency at a distance of 350 to 400 meters from point of burst. It is proper, then, to consider that the greatest danger will be for the nearest troops, and that the defender has every advantage to repel them at first. As for the rest of the troops comprising the support and reserve they will be either sheltered or dissolved in the line of skirmishers, and in this case the entire number of bullets fired too high are absolutely thrown away.

With the machine gun the conditions are entirely different. It is possible to direct its bullets so that they will completely cover the entire zone over which it is fired. If one wishes to direct its fire on the troops of the second line momentarily exposed to fire, it is only necessary to slightly elevate the trajectory, and then to send the next instant a stream of bullets on the first line in their turn visible. It is therefore seen that its fire is elastic and perfectly controlled.

Thus, as mentioned above, the counter attack, impossible to be executed from the high crests of a permanent work, but nevertheless indispensable in order to arrest and repulse the attack, is able to be entrusted to the infantry placed on the exterior of the work. The detachment charged with this

duty ought to be sufficiently near the fort in order that its action will be entirely confined against the troops of the enemy charged with the assault of the work. It is necessary, then, in the preparations of defenses of the intervals, to foresee the digging of trenches in a place favorable for fulfilling the required conditions. These trenches will be occupied at the proper moment. As long as the fort is not directly menaced by the assault the troops especially detailed for this part of defense will cooperate by its fire in the defense of the adjacent interval.

The machine guns during this part of the fight will fire exclusively at the units marching to the assault of the work. The occasion offering, they will sustain the counter attack of the infantry in firing on the troops of the second line who will wish to oppose this counter attack. Usually the company of infantry will occupy themselves exclusively with the troops charged with the attack of the fort. They will intervene at the moment when previously they would appear on the emplacements, but with this moral advantage that in place of having remained inactive during a time more or less long shut up in a central gallery they will already have taken an active part in the conflict.

Located from the point of view of quarters, supplies, command, etc., under identical conditions with those of infantry of a mobile garrison, they are able to cooperate with the latter in all the important phases of siege warfare where a numerous infantry is so valuable.

On its side the personnel of a fort equipped with machine guns, who occupy their fighting positions even at the moment of bombardment, are protected at a moment's notice. It is not necessary for the service of security and for other work to be done at the beginning of mobilization that an entire company remain at the beginning and for the entire siege attached to the fort. The service of security which devolves upon them during the different phases of the fight will not be impeded, because they are no longer lodged in the fort. Nothing will hinder them in their regular duty, even if one of the companies has for its exclusive object the surveillance of the terrain situated immediately in front of the work.

When the place is menaced, this company, not useful to the fort at the beginning, will be able to advantageously

reinforce the mobile garrison, who will advance toward the approaching enemy in order to oppose the investment. They will take part in the defense of a position taken at about 2,000 meters in front of the line of the forts and attempt to oppose the taking possession by the adversary of the terrain on which he ought to establish his attacking batteries and also to permit the complete organization of the intervals and in perfecting the state of defense of the works. In order to play a rôle of this importance, the mobile garrison will not be able to be too strong.

Later, in place of being shut up in the works during the artillery attack and during the advance of the enemy by siege trenches or approaches, all of the small detachments of infantry will be able to take an active part in the advance-guard or skirmish work without being influenced by the constant preoccupation of the destiny or fate of the forts which they might believe otherwise to be lost.

Therefore, cooperating in the service of security at a distance, in the defense of the advanced line, in the skirmishes, and finally cooperating in all the phases of siege warfare preceding the assault, are the advantages resulting from the employment of the infantry on the exterior of the fort and its replacement on the terreplein by machine guns.

Hitherto it has only been a question of use of the machine guns in stopping the charge of the besieger and of the duties devolved on the infantry placed on the exterior of the fort. Let us suppose that the counter attack delivered by this infantry has succeeded and that the enemy has been repulsed. What happens? There also the machine gun shows itself to be superior to the infantry.

The regulations say that if the assault is repulsed it is not necessary after the counter attack for the defenders to make an imprudent pursuit of the retreating enemy. The pursuit ought to be executed by fire. The chiefs of platoons should assemble their men and fire volleys. But this can not be done as quickly as one says it. Even after a peaceful assault and drill it is not easy to obtain a rapid assembling. What will it, then, be after a veritable assault after a face-to-face conflict? The men being affected by the emotions of the conflict, will their leaders hold them sufficiently in hand in order to obtain a rapid assembling—will they be calm enough to execute a

truly efficacious fire? It is doubtful. Now, the machine guns are there on the terreplein ready to fire on the enemy's troops which are retreating. They are able to immediately furnish a murderous and well-aimed fire and to realize the veritable pursuit by fire. They alone are capable of reducing the effectives of the assailant to the point of preventing any attempt at an offensive return.

But, some will say, if the infantry is placed outside the fort, and if in spite of the fire of the machine guns and the flanking pieces the assailant should be able to cross over the moat, who will resist on the terreplein? It is true that the infantry would be useful there at this moment; but one ought to ask in what moral state will troops find themselves, placed face to face with an assailant who will have traversed the accessory defenses, crossed the ditch without fear of the flanking fire, and who will throw themselves impetuously in the assault. Will they not believe themselves inferior? Will they defend the ground foot by foot or, taken by panic, will they fall back in disorder towards the posterns?

Moreover, in admitting the possibility of this combat face to face on the terreplein it is not absolutely necessary that it should be carried on exclusively by the infantry. This mission should be confided to the artillery, the greater part of which will be available at the moment of assault. Armed with their rifles and bayonets they should be equally able to make themselves useful at this critical moment.

And while these men will be resolutely sacrificing their lives the machine guns may be withdrawn from their emplacements and directed towards the posterns, where, better than a disorganized body of combatants, they will be in position to offer a last resistance.

In the consideration of machine guns it is equally proper to take into account the moral effect which they will produce on the assaulting troops. The perturbation of the morale of troops depends less on the number of men lost than in the time, more or less short, during which the vacancies are being made in the ranks, for while 15 riflemen obtain only 40 per cent of hits in four minutes, one machine gun will give 80 per cent in one minute.

One objection which one will not fail to make against the employment of machine guns in the forts is that they will be

employed the same time as the rapid-fire guns firing from the disappearing cupolas. But one may ask, in what state will be these cupolas after the bombardment of the fort by the attacking party? Who will dare to assert that they are sheltered from a premature destruction?

In a very interesting lecture delivered before the Ninth Artillery, Major Buisset took for his subject the destruction of the cupola armor, in order to show the insurmountable difficulties which the besieging forces would encounter in order to pierce a disappearing cupola, even if its thickness is not greater than 10 centimeters. However, it appears that one should not be too hasty to conclude that the 5.7-centimeter guns will be able to intervene at the moment of need. In fact, the important point is not so much the preservation intact of the armor as the accidents which may happen to the cupola during the fight and for which there will be no time to remedy before the assault. Thus a projectile may fall between the armor and the glacis-plate, bursting there and cause such damage that the rotation or raising of the cupola may no longer be possible. On the other hand, with the tactics of intermittent bombardment it may happen that the cupola may be raised at the moment when the adversary commences his violent and extremely rapid fire, and that a projectile or some of the fragments of one may strike the cylindrical armor when exposed to fire, so as to damage it so as to prevent the rotation or disappearance of the cupola, for there is only a centimeter of play between the armor and the glacis-plate.

In providing for such accidents it has been recommended that 5.7-centimeter cannon on carriages with wheels be employed and that they be used during the bombardment. They will evidently be preferable to the cupola exposed to almost certain destruction; but without considering the question of shelter and of supplies it is doubtful if these cannon would be light enough to be fired rapidly by hand from the emplacements—above all, if one takes into account that the adverse bombardment may have partially destroyed these emplacements.

With the machine guns nothing of this kind is to be feared; these arms are both light and powerful, easily transported, and capable of being rapidly installed at the place where their presence is the most useful. In awaiting their employment

it is possible to put them, with their projectiles, in the central gallery. By this means all fear of premature destruction is disposed of, and they are certain to be ready for use at the moment required.

To the above considerations it may be added that the fact of replacing the cannons of 5.7 centimeters with the machine guns does not necessarily include the suppression of the infantry. It is indisputable. But why this superfluity of means? Why leave to the infantry a mission which the machine guns can better fill? Why confine this arm to a rôle for which it is not fitted? Infantry without the cannon of 5.7 centimeters may not be sufficient; the infantry with the machine guns is in the way. Then the fort is no longer suited to it. Be it so! That is why the infantry ought not to be confined to the defense of certain points. But it is necessary that it be given its liberty in such a manner as to permit it to utilize all of its power and to replace it on the works by something more powerful from the point of view of efficacy of fire and better adapted to the rôle to be filled.

Moreover, the morale of the infantry, as well as that of the occupants of the fort, have only to gain by this solution; in fact, the morale depends in a great part on the health, and to preserve that it is necessary, above all, to have a wholesome and abundant nourishment, pure air, and sound sleep. Lodged on the exterior of the fort, the infantry charged especially with its defense finds itself under this order in the same condition as the troops guarding the intervals, while as for the garrison itself, it will have quarters as much more spacious and a nourishment as much more abundant as it will be less numerous.

It is impossible to insist too much on this point; moreover, certain engineers have understood its importance. It is for this reason that Major Deguise proposes the building of a blind galley running exteriorly, such as a long balcony in front of the windows of the rooms of the escarp from the front of the gorge and extending directly to the quarters of the troops, and with window doors, so that the men may be able to promenade there and take the air.

Nothing is lost by not using up prematurely the moral value of the defender. It moreover strictly conforms to the general principle which rules all the operations of siege war-

fare—viz., to gain time—and this principle will have the greatest effect, specially considered from this point of view, if there should come out of the fort troops not only useless, but a nuisance to themselves and to others.

One may also object to the method which, by excluding the infantry from the fort, confides entirely the defense to machines; that is to say, one places himself at the mercy of mechanism whose functions may become defective. That is true. But is man not also a machine—an admirable machine, without doubt, but equally subject to get out of order?

What will become of this machine, in fact, if its most powerful support, the morale, is broken? It is that which gives to the soldier the courage to support the privations and the fatigues of the siege; it is that which maintains the discipline and the authority of the chief; it is that which remains when all else is lost. For in the forts the conditions of life are oftentimes disastrous. During the siege the men will be confined in close quarters, perhaps hot, lighted, even during the day, by an artificial light. In what moral state will troops be who will have lived during a certain time under such conditions? Does it not appear that it may be, as well as a machine gun, susceptible of being out of order? In reducing by 200 men the garrison of the forts one has prevented to a great extent all the inconveniences mentioned above, and in every case one will have removed 200 men from these influences.

Moreover, one may have all confidence in that which concerns the functioning of the mechanism of a machine gun. Experiments made in Austria have demonstrated that a Maxim will function very well after firing over 35,000 rounds.

The ideas mentioned above may find their application in the forts of the Meuse. Although their triangular and quadrangular trace is not advantageous for the employment of machine guns, it is, however, possible to defend them thereby, by placing a machine gun at each salient and at the center of each front—from 6 to 8 machine guns, according to the form of the work. In fact, one may even discount the intervention of one or two cupolas of 5.7 centimeters, and therefore take only 4 to 6 machine guns. For the 24 forts of the Meuse that would be about 100 to 150 machine guns, which would replace 80 cupolas of 5.7 centimeters and 5,000 rifles. Thus, as has been previously stated, the machine guns of a fort may be

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ADVANTAGES THAT THE MACHINE GUN ASSURES TO THE THREE ARMS.

By Lieutenant-Colonel VON LAYRIZ, retired.

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It is dangerous to try to predict the importance that the machine gun will acquire, especially of that arm which has not been employed with success in war on a large scale. This is especially risky with respect to machine guns—first, because of the rather humble part that appliances of this kind played in the course of the campaign of 1870 is still in the memory of all; second, the services that they have rendered in Manchuria both to the Japanese and to the Russians, who call them “pulemiets,”^a are too little known to draw a clear conclusion on the subject of the value of the machine gun.

Since the adoption of improved rifles it is possible to produce sheaves of bullets equivalent to those of the old rifles by executing firing from masses (fire in four ranks or two kneeling) by the infantry or shrapnel firing by the artillery, by the aid of which sheaves one may inundate the ranks of the enemy when one is acting on the offensive and control the terrain to be traversed by the assailant in the case of fighting on the defensive.

Therefore, one will ask, worry armies with the trial of the machine gun at a time when one has not succeeded in giving that arm greater efficiency than that of arms now in use.

The present man—that is, the one of the twentieth century—has seen so many things and instruments strongly different from those heretofore come to naught that the conservative attitude of his ancestors has disappeared from him. Too often, he has seen that progress in the technical domain was made only after energetic and repeated efforts, and from this he concludes that it would be absolutely illogical to

^a Pulemetŭj.—EDITOR.

show himself too skeptical concerning a new invention, for the single reason that in an initial trial it had not responded as had been expected.

On the other hand, it would be equally an error to wish to solve a question of armament by a commonplace such as this: "We are living in the age of machines; therefore machine arms belong to this era." As the plow, the symbol of peace, gives quite different results to-day, when it is drawn by steam, than of old, when it was drawn by oxen, likewise, one might say, firearms, which in war have taken the place of the sword, should take the character of machines and acquire a hundred-fold power in order to insure destruction on a large scale.

In order to fix the actual importance that should be accorded to the machine gun from a tactical point of view, the principal point to be considered is the question of opportunity. From an examination of this question one will be able to decide whether machine guns should be considered only as a branch, analogous to the old crack-shot detachment, or, indeed, if their adoption has a more general, more grand importance.

It is difficult to determine the place which will fall to the lot of the machine gun in the tactics of the future, considered as a new arm. In fact, the conditions under which this arm will be utilized will vary according to the theater of war and the adversaries who are opposed to each other. In the colonial wars and in struggles between units weak in numbers the machine gun has proven its value; but this is not for that reason an argument for its use in wars such as continental armies contemplate. That which proves that machine guns may become expedient in the struggle between large masses is that the Russians are hastening to replace with machine guns hastily forwarded from Europe the guns of this sort which the Japanese captured from them on the Yalu. The latter, moreover, have advantageously used instruments of this kind.

In taking as a basis modern armament and the rules universally adopted for its use one notices in modern combat with hand firearms and cannon two clearly-marked zones: First, from 0 to 600 meters (some authors fix this limit at 800 and some even at 1,000 meters), the zone of well-aimed

ketty; second, beginning at 1,400 meters and the extreme range, the zone of fire for artillery.^a 0 and 1,400 meters there is then a zone which much to the infantry as to the artillery, but in action of either of these two arms should be conceptional. Now the machine gun seems fittingly p.

the infantry arm can give considerable results at water than 600 meters. It suffices to recall in this the losses sustained by the Russians from the fire of the Turks in course of the war of 1877-78. South African campaign the English also suffered from the long-distance fire of the Boers, even this kind of fire the Boers were unable to sight as in firing at short range.

the infantry will be able at distances greater than to obtain serious results against favorable objects as artillery, for example—likewise the artillery able at distances less than 1,400 meters to succumb to the fire of the infantry.

try and artillery will readily yield to machine between 600 and 1,400 meters. The cavalry rested in the adoption of machine guns, but the presents a different aspect for each of the three arms

e.
first what there is for the infantry:

distances greater than 600 meters presents for inconvenience of requiring the cooperation of a number of men. The best thing under these circumstances would be to be able to utilize a unit in close order volley firing. Now, one is convinced that here things that it will be only rarely possible to realize constitute the exception to the rule. The teachings the English drew from the South African war are pertinent; but they agree upon this point: that volley which in favor in the English army, is to be rejected. In action of an adverse fire, volley firing does not suits, and at longer ranges the firing is difficult to

a of shields will not permit artillery to approach infantry with open terrain, because the teams will be destroyed by the fire the location chosen for going into battery.

execute, because it requires the use of elevated sights. On the target range the results may be satisfactory; but the conditions of practice can not be compared to those actually met with. Let one but imagine the tumult produced by the striking and explosions of the enemy's shells and the disorder that that would necessarily create and one will admit that in war firing at long range by infantry will be something entirely different from range practice. Infantry must, however, have frequent recourse thereto, for if, as it is probable, one applies strictly the principle of putting artillery in action in large masses, infantry will not be able to count on its immediate aid as frequently as in 1870. The putting of large masses of artillery in action requires time, and care will be taken not to put these masses in action against objects of secondary importance, so that the struggle with the opposing artillery will not have been closed advantageously; and whenever the artillery does not succeed in completely reducing the opposing batteries and there are not then pieces of artillery available to accompany the attack of the infantry, the latter must often accomplish its task in the attack without being supported by the artillery.

The assistance of the artillery constitutes, upon the whole, for infantry one of the unknown quantities of the problem to be solved. In the attack it will frequently be necessary to be content with having the numerical superiority in artillery where the decision must be produced. Along the other parts of the line the infantry must have recourse to long-range fire in order to replace the action of the absent artillery, and it is then that the inconveniences of this kind of fire will be felt. In fact, one will then see how speedily the cartridges in the belt are consumed and how easily the firer will allow himself to carry on a superficial fire poorly sighted.

One thing which has been stated for a long time and which has been confirmed by the South African war, is that it is only by refraining from firing at long range that the skirmisher may be brought to actually take sight at the shorter ranges with the fixed intention, in spite of the danger, of making a hit at each shot. If they are prudent, the commanders of infantry will have recourse as seldom as possible to fire at long range, for the single reason that the foot soldier in executing this fire, where he sights only superficially, quickly loses the

ting correctly, a habit that one has taken so great
e him acquire; but if the infantry undertook not
or to fire only rarely at distances greater than 600
rs it would lose unquestionably many occasions
g its ammunition to advantage. Thus, for exam-
lery once installed in its position could no longer
l to as telling a fire, even at short ranges, as it
been during its entrance into action.

the Prussian batteries remained several hours
infantry, which inflicted great losses. In future
illery will be able to resist for a still longer time,
ccount is taken of protecting shields. The can-
nel or lie down, at the order of the commander;
ing, and as the service of the piece can be accom-
many less men than formerly, one will always have
sal a certain number of cannoneers who imme-
oing into battery will commence with the shovel
of shelter for the personnel.

, then, how important it is that the infantry
artillery the moment it arrives in position and
bering.

of the artillery fire depends on the choice of posi-
ll with the ranging instruments, and the various
ken in preparation for firing. Now, then, can
allow the field officers of artillery and their assist-
e about in its front at distances less than 2,000
o prepare for the entry in line of a mass of artil-
being hindered in their operations? The less the
s of artillery are troubled in their work the greater
effect of the fire of this arm when firing is com-
ut what is the infantry officer to do who, in order
y a few horsemen, must execute volleys by entire
nd at such great distances?

*objectives of this sort, where musketry fire is neces-
sary for skirmishers to execute by reason of the
e object, the use of machine guns by the infantry
is desirable.*

on has already been expressed that at a time not
t, when the transitory period of trials with
as detachments will have been passed and each
s at its disposal one or more guns of this sort, the

infantry will no longer execute musketry fire except at short ranges, which with the present trajectories extend from 0 to 600 meters. It is impossible, in fact, to reconcile these two contradictory requirements of knowing how to execute firing at long range at once rapid and well-aimed.

For long-range firing there must be a sheaf of balls of great depth. A great dispersion of balls, produced by superficial aiming, would be, then, an advantage in long-range firing, because, without having recourse to several elevations one would thus remedy the error committed in estimating ranges, climatological influences, etc. But it is indispensable, on the other hand, to give to the sheaf a certain density to obtain in a way the effect at the point and in the time desired. For this reason firing at long range ought to be executed by a large number of firers acting together. But, as in most cases, this is a condition impossible to fulfil, and as this kind of fire will give, besides, very poor results, one must, in order to obtain the equivalent of fire from mass (fire in four ranks), cause the most rapid possible firing by the men who may reasonably take part therein.

Actual firing at long ranges executed by infantry skirmishers becomes, then, a superficial or approximately aimed fire, which is rightly considered as an aberration by all those who are occupied with the study of these questions from the ballistic and psychological point of view. In fact, this is the surest means of spoiling the best marksmen. Therefore, if the infantry had at their disposal the mechanical weapons necessary to execute firing at long range with small-arms ammunition the results that it could obtain by its musketry fire at short range would be improved. Now, as the latter kind of fire is decisive in the attack, a greater importance should be accorded to the machine gun for this latter reason than for that other reason usually given, that this machine can on the defensive advantageously replace marksmen for the purpose of sweeping roads, bridges, defiles, etc.

It will be some time yet before that radical measure is adopted of simplifying the firing regulations of the infantry by suppressing completely the long-range firing.

This will be done only when the infantry will have been supplied with a sufficient number of machine guns for each company to have at its disposal, under all circumstances, one

these machines, and the advantage which will result from this suppression of fire at long range will compensate itself for the inconveniences that the adoption of machine guns might present.

Usefulness of machine guns for cavalry is generally admitted, while their usefulness in infantry combat is still in question in some quarters.

The cavalry was not sufficiently instructed in fighting with machine guns and was only partially armed with the carbine.

Before the war those in authority demanded that the cavalry be rendered more independent, so that it would not be necessary to attach it to infantry, and that it would be able to accomplish its various duties in reconnaissance and in operating successfully. The improvements made in the armament of infantry would have placed the cavalry in a much worse position if it had not been drilled in fighting on foot, profiting by the teaching of the secession and the ideas expounded by General Schmidt in his well-known studies on the instruction of cavalry. The latter has certainly not lent itself gracefully to modification, because it feared to fall to the rank of infantry if it accorded too great an importance to the mode of action. The idea of creating a mounted cavalry which would rank with cavalry, properly so called, is although troops of this sort rendered great service in the African war. The cavalry arm of the continent wishes to guard the knightly character which it has acquired, due to victorious attacks executed of old, and this tradition has transmitted to them.

Advocates of these ideas can but applaud the adoption of machine guns and their attachment to cavalry. For the use of these weapons will be clearly put out of action by the adoption of machine guns, an action which always admits of a series of elements on account of the led horses and where the use of fire appears out of all proportion with the elements of which they furnish the elements. In the cavalry is supplied with a portable machine gun, which is in reality only an automatic rifle a little heavier than the others.

Germany has been the first to decide on the adoption of machine-gun sections. In that country, where it is

principally a question of mountain warfare, the machine gun will often be used in place of the mountain cannon, when in the place of the latter, one desires the use of an arm with a flat trajectory. For the Swiss army, which must take account of the peculiar topographical nature of the country, the method of using machine guns differs from that adopted by the armies of the great powers. Among the latter, indeed, the machine gun must not only replace the fighting on foot, but it should also contribute to the decision in the battle by facilitating and by completing the action of the cavalry in the action. This arm has incontestably lost some of its importance since the perfecting of firearms, both portable and otherwise. It is a question, then, for the cavalry to determine if by using machine guns to prepare for its charges it might not regain its lost and lamented importance.

The infantry has such a high opinion of its strength that everywhere units roughly handled in battle and deprived of their leaders perfectly resisted cavalry whenever the latter made use of saber and lance alone. But the use of the machine gun will increase the moral effect of cavalry. Moreover, it will not have to count on its horse artillery to prepare its attacks. At maneuvers it is only by retarding in an unreasonable manner the charges in mass of the cavalry that one succeeds in making them prepare with artillery. The adoption even of very rapid firing artillery will not change this situation in the least.

In order to be used for an analogous purpose, machine guns must be provided with a carriage other than that with which they are provided for coöperation with infantry. The latter ought to be replaced by a two-wheeled carriage and drawn by two horses, the firing to be done without removing the machine from its carriage and without unhitching the horses.

Mounted upon a carriage of this kind, the machine gun may be moved away from roads, but it has the exterior aspect of a cannon. This resemblance was fatal to machine guns in 1870; but the present weapons of this kind are distinguished from the former in that the gun, which constitutes the vital part, may always be removed from the carriage with the frame which serves as a trestle for firing, and this is what will always be done when the terrain offers cover.

etry firing that the infantry will deliver will generally at rather long ranges. Now, machine specially fitted for this kind of fire. It goes without ammunition must be able to be sent up in sufficiency and upon light carriages which may leave the pack horses, like those in Switzerland, would be fitted from this point of view.

Machine guns attached to the cavalry will often be used in the emplacement of the horse artillery, which will consequently, to be put in action with less caution, relying on this account the movements of the masses and without requiring an escort furnished by detached cavalry.

It remains to be considered the question of the attachment of machine guns to field artillery. So long as the latter remains only a troublesome appendage, a specialty tending to complicate its matériel and instruction, instead of aiding them.

If high authority had decided to create a new arm to organize some special units of machine guns, the artillery would have continued to dishonor them. In fact, this serious competitor precisely at the time that the artillery, faced by its new organization and armament, was unable to undertake to defend the title of principal arm it had won in 1870 and to preserve it in spite of the results accomplished in the armament of the infantry. The artillery ought to have a matériel which especially meets the different rôles which devolve upon it in the comparison with the three arms, where one completes the other where it is impossible to replace it by reason, indeed, of the armament. The rôles which devolve upon it are: action at long range, the destruction of resisting objectives, the destruction of sheltered objects. As firing at short range is of importance for the artillery, the kind of pieces which compose its armament must be modified, and pieces for which the machine gun will be in the majority. Some pieces of large caliber will be used for special purposes.

When machine guns were adopted in large numbers, the artillery was provided with a greater number of pieces for which the machine guns then being charged with the flat-

trajectory firing in the zone comprised between 800 and 1,600 meters.

Thus far, indeed, the infantry had of itself to resist artillery up to 1,400 meters and to repulse the attack of masses of the enemy. It will be still more able to do so if there is added to it machine guns provided with ammunition in sufficient quantity.

The artillery will thus find itself discharged of the rôle of dominating the zone inferior to 1,400 meters. It will be then no longer tributary to shrapnel, which was especially adapted for repulsing the attacks of infantry. For the struggle against artillery with shields shrapnel could be replaced by shell fitted with double-action fuse and no longer enter only for a very small part in the supply of ammunition, unless it is desired to take a middle course and adopt a unique projectile, which, like the Maxim-Nordenfelt, contains shrapnel bullets in the grooves of an iron core, with, at the center, the strong explosive charge of the shell, very useful for observation of hits and having great moral effect.

As the infantry, if it is given machine guns, will be able, by firing from masses, to repulse all advances of the enemy, the artillery will not be required to accompany the attack of the infantry. In truth, this could not be done heretofore except by weak units, by batteries or groups; but the artillery nevertheless is of the opinion that violates the principle of its use in mass, a principle that it rightly extols.

In a chance battle, where both adversaries are acting on the offensive, it often happens that the artillery is deployed very soon, before the infantry of the advance guard is in condition to control the terrain in front of its position. In this case it is the duty of the cavalry to protect the artillery. But on account of the small number of rifles that the cavalry can put in line when fighting on foot, and considering its repugnance to fighting thus, the field artillery can but wish that machine guns be adjoined to the cavalry in order to keep the infantry of the enemy at a distance. Then the artillery would be able to conform to the principles generally followed for the opening of the artillery duel and to make judicious use of the shelter of the terrain, whereas, if it must concern itself with its own security, it will often enter into action prematurely, and thus

to the adversary the position throughout its whole

advantages that the different arms would be able to obtain by the addition of machine guns by its use in battle. It is probable in the course of the period of transition that there will be a slow traversing and during which one is bound to hold on to all events a certain number of machines of this sort, forming thus a sort of special reserve body, which remains at the disposal exclusively of the commanding general. The consequence of this is, first, that it is necessary to take care in the construction of machine guns, of their double use, whether of their employment with infantry as well as with cavalry. Combinations of this sort could never give perspective. The infantry, for example, has nothing to do with the machine which, under the fire of the enemy, must be supported by horses.

What would suit it best would be a machine that could be transported on the march on a good spring vehicle, from which the machine would be removed before entering the zone of the fire of the enemy. Starting from there, the cavalry would take the machine to the successive firing positions or rather would draw it there, if it was mounted on a carriage. For the cavalry, if one was considering the replacement or the reinforcement of fighting on foot, it is best to carry the machine guns on pack horses (as in Prussia and in Denmark), because this disposition permits maneuvering with these machines in mountainous regions; but if it is desired to be able to prepare a cavalry attack against infantry and artillery one must give preference to the English system, which comprises a light two-wheeled carriage, because the going in battery of machine guns supported by pack horses or mules will always require one and one-half minutes, and generally two or three minutes.

As the sledge frame may be removed from the carriage the machine gun might also be carried or drawn up to the front line whenever it had to fight in concert with the cavalry or dismounted cavalry. Frequently artillery operations in the vicinity will already have established certain ranges and will be able to give some very useful information to the machine guns as to the points to be fired on.

SPECIAL RÔLES FOR MACHINE GUNS.

Numerous experiences prove that machine guns are of very great utility in colonial wars. They are equally very useful with independent detachments, like mixed columns, detachments of cyclists, of automobilists, for the protection of lines of supplies, and particularly for railroads. The use of units of the infantry and of the cavalry for this purpose enfeebles these arms considerably, which may become an ill omen when numerical superiority becomes one of the principal factors of success.

For the purpose of suppressing uprisings or for controlling the great foreign cities small units of troops will be sufficient from the moment that they are provided with machine guns.

General Rohne has demonstrated, in the *Jahrbücher für Armee und Marine*, that the machine gun is not itself to replace in mountain warfare the mountain gun, since the latter is a rapid-firing gun; but it can be employed very usefully in cooperation with the mountain gun for the defense of defiles. Mountain guns—such as are in use in the Japanese army, for example—have necessarily the character of light howitzers—that is to say, of guns for curved fire.

In joining machine guns to the mountain guns one completes the action, thanks to the raking fire with which they may be charged and which could not be effected by these cannon, especially against movable targets.

There will be equal advantage in joining machine guns to columns and convoys, because mounted upon carriages these machines will permit the reduction of the effective of the escorts. The latter will be able, moreover, to group themselves and to act in a body where circumstances require it.

Curiously enough the English appear not to have furnished machine guns for the block houses that they built some time ago to protect the South African railways. They had installed some guns of this sort on railway locomotives or on flat cars placed in front of the locomotive. The results were good. Such results could not be expected from automobiles protected and armed with Maxim guns or machine guns, because these vehicles would become too heavy and could only be moved slowly. Besides, the circumstances under which they would be useful to support detachments pushed in advance along a road and

superior forces, for example, requires the great-

In all cases of this kind the armor is completely
Quickness constitutes the best protection.

warfare both adversaries will be able to make use
guns advantageously. Conjointly with them
cannons of small caliber will be found useful. The
over, have already been used under transportable
designed for Schumann fire. In this kind of warfare
may use machine guns at long range for the pur-
suing the work of the besieger. In any case it will
to prevent in this manner the employment of
miners on the earthworks.

attainment can be accomplished by a smaller force,
it is possible to concentrate more troops to oppose
to try a decisive operation with superior forces,
machine guns will dominate the zones which will be
menaced. One might in case of need execute indi-
vidually with machine guns in siege warfare, because time
is wanting in which to prepare for this firing. Night
operations executed on both sides by aid of machine guns,
machine guns will contribute greatly to the result.

It is possible also to effect a plunging fire with machine
guns from sheltered troops, especially if advantage is taken
of positions which the artillery will be able to furnish in
siege warfare. Machine guns will be able, finally, to serve for the
purpose of wire entanglements, if used at short ranges, by
pulling down the stakes that support the wires. The trials
conducted in the manufacture of arms and ammunition by
the Japanese proved, in fact, that it is possible to destroy
wire entanglements by the aid of the machine gun. The assailant
with promptness all the means that there may be in
order to destroy these terrible obstacles. In the battles of
1904-1905, which lasted several days, the Japanese sustained
a large part of their losses during the time they were
trying to destroy the wire entanglements and especially
when they were trying to pull up or break down the stakes
that supported the wires.



THE NECESSITY FOR MACHINE GUNS.

By Lieutenant-Colonel VON LAYRIZ, retired.

of the Second Division, General Staff, U. S. Army, from the *Kriegstechnische* (Part X, 1904), by Capt. FREDRIK L. KNUDSEN, Eighth Infantry.

Machine guns are still ascribed the same disadvantages as their predecessors, the mitrailleuses, and only a very limited sphere of action is accorded to them on account of their instability against artillery fire. Thus sentence is at once pronounced against them, because the army must retain simplicity and has no room for specialties. The army has quickly discarded such—as, for instance, the pioneer companies, detachments of rampart shots, special companies for fire against balloons, which were used during the Boer War. If no other use for the machine gun is known, it is an essentially defensive weapon, and must be replaced by a few well-covered shots, provided with abundant ammunition or by a single rapid-fire gun. This criticism made concerning it as a hybrid weapon is not valid at any rate.^a

It is already before tried to show that the modern machine guns, capable of being used apart from wheeled gear, are of great value to the infantry in carrying on its fire action beyond the short ranges, because they rise slightly above the horizon. In contrast to the mitrailleuses of 1870. Construing this in thus, there is no justification in comparing the machine gun with the rifle or gun.

The opinions regarding the future of the machine gun should here be mentioned that of General Wille, who

has seen machine guns (pullemetűj) which were lost at the Yalu because they were killed have shown themselves to be just as unsuitable as the mitrailleuses of 1870. They lacked the advantages which the sledge-carried machine guns of the German machine guns of being capable of forward movement by means of men alone. (The manufacture of the German machine gun takes place in the German arms and ammunition factory at Berlin.)

enjoys a great reputation as a military technologist in the army. In his *Ordnance and Gunnery* of 1895 he discusses fully all the models existing at that time, but closes the part, after emphasizing the disadvantage, that with one machine is lost, through the failure to work or damage, the fighting equivalent of 30 men, with an unfavorable criticism of this new kind of firearms. He says:

"It seems for this reason not worth recommending the use in field warfare of firing machines that are inferior ballistically to small arms and essentially disadvantageous tactically against skirmishers. Only in the defense of prepared intrenched positions can they be used with considerable advantage under certain conditions just as well as in fortress warfare."

In the new edition of 1901 the equivalent of 30 men to 1 machine gun is retained. The verdict concerning the fighting value of machine guns is, however, no longer so decidedly unfavorable as formerly. It says:

"A certain moderately careful economy in the assignment of machine guns to the field army is therefore to be strongly recommended."

General Wille goes in his technical considerations on the principle that the machine gun is equal to only 30 skirmishers. The opinion of General Rohne, who is considered an authority on all matters of the technology of firing, might be contrasted therewith, which assumes 70 skirmishers as the equivalent in the effect of the fire.

It should before everything be kept in mind that the domain of action of the machine gun comprises the ranges which are too great for the fire of skirmishers on account of psychological reasons and too close for the use of artillery in masses—namely, the zone from 600 to 1,400 meters. The machine gun is not exactly intended to replace the rifle at short ranges, where the skirmisher can fire well-aimed shots rapidly.

Although the machine gun can also participate in the fire of infantry at short ranges, the principal domain for its use will, however, be the zone beyond 600 meters to the range limit of 1,400 meters, which can be extended to 2,000 meters under good conditions for observation—as, for instance, in the South African climate during the Boer war. At these long ranges,

of infantry fire, the taking of the target and the action are made so difficult to the skirmishers that demanded by General von Lichtenstern in his *Firing* the infantry clings from habit under all conditions to the principle of well-aimed fire only 3 to 4 shots per minute to be fired by individual skirmishers. The machine gun firing 400 to 600 shots per minute is therefore equal to 100 skirmishers in the firing line in the zone from 600 to 1000 meters.

Conditions for the use of the machine gun are appraised by the fact that the fighting value of 100 skirmishers is eliminated by a machine gun which is disabled by the enemy's shots; but nobody will maintain the pretense that 100 skirmishers fire like a machine gun under the same conditions. These occupy in the firing line, together shoulder to shoulder, a space 100 meters long; the personnel of the machine gun, taken as 4 or 5 men, occupies a space of only about 3 meters. The losses sustained by the ratio of the width of the vulnerable surfaces

of the machine gun, with its present form, which permits of it being so easily discovered, just as little above ground as the skirmish line, is scarcely discovered, even with field glasses at short distances, is small; but in the case of the thick skirmish line of 100 men the objection holds good which was made to the mitrailleuse, that it draws the fire of the enemy's artillery. If the principle of the so-called Boer system is applied for 100 skirmishers by taking an interval of 100 meters between men, an extension results for which there is room at disposal and by which the fire effect is not influenced through the defective ability to lead. The fighting elements, skirmish line and machine gun, have a special domain of employment and are incommensurable. Where the skirmish line is used for the short-range decision, the machine gun is not needed, where this is at disposal with small caliber ammunition for long range fire, the deployment of the skirmish line is a waste of strength on account of the losses sustained through artillery fire.

Another objection which is always raised against the machine gun is this, that it enters into competition with the gun. But the zone of action assigned to the gun for the main struggle begins first at 1,400 meters, the extreme limit of the machine-gun fire. Both weapons have, therefore, different domains of action.

There is not a question of replacing but of amplifying the artillery fire if by the introduction of a large number of machine guns their flat trajectory fire can be counted on. It would then be possible to equip the artillery better for high-angle fire, which is indispensable to the support of the infantry attack in its last stage, instead of making the considerations of grazing alone all important in the choice of the field gun.

Machine guns are especially valuable immediately after the assault in order to hold the captured position until the artillery has come up to occupy it. It is this short but critical moment for the attacker where the power of resistance often fails on the part of his infantry, which is without leaders and psychically and physically exhausted, against the defender's counter attacks carried out energetically.

Different text-books on ordnance and gunnery and tactics admit that the machine gun is eminently suited to defensive purposes. Many see in this an objection to the weapon. As the fundamental principle of tactics is always taught the offensive solution of all problems. The machine guns would according to this be the weapons for the so-called "position clingers," whose tactical alpha and omega is the holding of positions.

All discussions of the Boer war assert the opinion, as this certainly shows again, that the offensive is the stronger form of the method of fighting and that the lack of the offensive element can never lead to a complete victory. This reads very prettily, sounds smart, and is certainly true with regard to the Boer's method of waging war. But whoever has occupied himself for a longer time with the question "What is suitable in War" will know how this emphasis of the offensive is meant. A sharp contrast between it and the defensive does not exist in a tactical sense for subdivisions of a fighting body of troops. For these the scope of fighting is limited by the task, for which reason they have to act so that they fight

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according to the same principles.

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mits thereby that it can not be dispensed with on

objection is this, that the machine gun can not aid
y attack to gain the superiority of fire. The ques-
er this is possible can, to be sure, be answered con-
only in the affirmative. When in firing exercises
peace a machine-gun detachment is given the task
lying down skirmish line in position for firing, no
ect must be hoped for at ranges from 600 to 1,400
n that of a skirmish line equal to it in fire power.
ss, only a little imagination is needed to conceive
the machine guns are directing a sweeping fire on a
nish line the moral effect of their fire will assert
avor of the attack. The fire of the skirmishers
es under the influence of that of machine guns and
r becomes completely unaimed. Our own skir-

mishers are therefore able to advance to the range at which they can make felt effectively the superiority of their number and on account of the moral superiority of the attack a greater fire effect by means of the short-range sights.

It remains only the question whether the machine guns can keep up a rapid fire for the length of time required by the attacking infantry to cross the critical zone. Even with an abundant ammunition supply this fire can last only ten minutes. How is it when the adversary avoids the fire effect altogether during this time? In this time 500 to 600 meters will certainly be covered. Only in case the infantry attack can develop under cover of the ground at the distance of 1,400 meters may the skirmishers succeed in reaching the 800 meters' range. But the progress of the attack is, on the other hand, so slow that the rapid fire of machine guns can not be kept up for a sufficiently long time.

In this case one quality of the machine gun, which is too little appreciated, might make itself felt. The rapid fire of the machine gun is continually spoken of, and it is forgotten that it takes the place of a preeminently accurate weapon.^a Since in the case of an infantry attack, which is carried through in a tactically correct manner, a part of the attacker's artillery concentrates effectively its fire simultaneously with the advance of the machine guns and skirmishers on the lines of the enemy's infantry, it may be counted on that the quality of the defender's fire action will be influenced thereby. Such a firing line must not be pictured as that seen on the target range, where every skirmisher is lying down in the position of aiming and delivering an aimed fire, consequently, where everybody is equally well visible to the adversary.

Although it is assumed that an equally good adversary has to be reckoned with, it will, however, be admitted that individuals expose themselves to the enemy's fire while the action lasts. Every skirmisher makes pauses in the firing, since he as a human being is not capable of enduring a continued strain on his nerves and will. For this reason the heads of single

^aThis assertion can be refuted by the result of hits which would be obtained with good shots on the target ranges in time of peace. But the difference in war is this, that the machine gun retains its perhaps smaller accuracy under the enemy's fire and the mass of skirmishers does not.

will be visible for a short time only, so long as they are in the line of fire.^a

A machine gun can utilize this short time to disable the

In the case of the machine gun there is not a long-continued rapid fire, but only one of a few shots which it has, perhaps, to fire 20 to 30 shots. When the skirmish line serving as the object has been accurately determined by a range finder or by means of observations and the influence of the wind on the direction of the projectiles has been ascertained by means of tests, this time suffices for hitting the skirmishers or making them become visible for a moment. There is thus a machine gun on a small scale, which according to Mieg's theory gives a result on low objects at long ranges. A good machine gun is needed. The range limits for this kind of accurate fire will be different also in the case of skirmishers with rifles, according to the weather or other causes influencing the vision. This kind of fire will often be possible at distances of 200 to 300 meters. It will often require an advance to

Since the adversary has to contend with the machine gun, the advance will in many cases be possible to a considerable distance (oncoming twilight).

Use of the machine guns is preferable on principle at long ranges, since the trajectory of the rifle is here more gently curved to make possible a firing over the skirmish lines. It can be demanded of the machine gun that it should be served by selected shots, just as well as in the case of artillery that one's own infantry is not to be hit by its fire while this can not be done in the case of the mass fire of the rifle.

Rapid fire of machine guns is to be saved for the case when reinforcements on the part of the enemy, which extend the line, become apparent for cavalry attacks, for unlimbering artillery, above all for repulsing all attempts to recapture a position taken, for mass attacks, and

Even if such use of rapid fire from machine guns in the attack poses is rare, the consumption of ammunition will,

The experiments between skirmish and machine-gun fire are given in the following tables. The latter shows smaller results when the distance for the objects is greater. The objects are fixed targets, which represent lying-down skirmishers. Results of experiments on disappearing targets are lacking.

however, be very great, because the opportunity for accurate shooting by expending 20 to 30 cartridges recurs often.

We then come to another main objection, that ammunition would always be lacking for utilizing the full development of the power of a self-loader. It certainly can not be doubted that the ammunition supply of the machine guns must foresee a consumption to which every existing rule is inapplicable. After victorious campaigns it is stated with a certain satisfaction that the average consumption of modern weapons has fallen considerably below the standard, which had been assumed previously on account of lack of experience. In the case of the allowance of ammunition there is not at all a question of this average, but that no troops shall be able to run out of ammunition when they must fight an adversary at an effective range. Where machine guns are at disposal every kind of long-range fire by means of skirmishers, which leads to waste of ammunition, should be forbidden to the infantry, and this should be provided with pouch ammunition sufficient for short-range fire. Every means for bringing up ammunition into the firing line should be provided for and large quantities thereof should be placed in readiness on the defensive.

But machine guns, which are intended for long-range fire, must for this purpose have at disposal just as large a quantity of ammunition as is required for delivering a mass fire on the part of the infantry. Three thousand to 4,000 rounds have until now been assumed as the ordinary supply for a single machine gun; but where an infantry attack is impending 10,000 rounds per gun must be counted on.

It is quite generally conceded and there is certainly no doubt concerning it that the placing in readiness of the ammunition and bringing it up into the firing line is paramount to victory in the battle of the future and often more important than the number of guns and rifles.

The inclination to be stingy with ammunition prevailed too long in all armies. It is well warranted that the responsible leader apportions the issue of ammunition which he considers necessary for a particular purpose. The pouch ammunition should be an iron ration for the zone where the distribution of ammunition is made difficult or is often no longer possible in the zone of the close sights. At longer ranges the ammunition for the long-range fire of the infantry must be taken from the

wagons or an established ammunition depot. Machine guns take over the long-range fire of the infantry in readiness of a large quantity of ammunition. The position of the position must likewise be provided for, the preliminary condition for the result. Where the machine gun is drawn by horses or pack horses come forward, the bringing up ammunition by means of men, who approach the firing line by creeping, must be used to advantage.

The weighty of all objections is this, that the machine gun, the French mitrailleuse, lacks the attribute of a good observer. Observing the position of the mean trajectory with reference to the object. But the same objection must be made to the fire of infantry. The infantry has for a long time been aware of the possibility to fire at long ranges, which the machine gun rifle presents, because the hitting depends on the observer, on account of its defective power of observation. In the infantry, taught by war experience, it must nevertheless be borne in mind.

The machine gun is decidedly superior to the mass fire of infantry on account of the better power of observation. The accuracy of shots of the machine gun is stable. Even when the deviation is small. While it is not justified to compare the mass fire, especially when the danger from the machine gun increases the errors in aiming and through that, to come to the conclusion that, because a few shots hit the object, the other shots, which have not been hit, have also struck near the object, this is rather an admission in case of the machine gun. But it depends on the position of the ground whether the striking of a projectile is possible at all. At long ranges, even in the case of dry ground, dust thrown up can be seen only when many shots are fired simultaneously, consequently in the case of the mass fire of a group of barrels, as in the mitrailleuse. The single-barrel machine gun is consequently still more accurate upon the employment of range finders or on good ground than the multibarrel mitrailleuse of 1870. It is from the reports of the French batteries that they had no other evidence of the correspondence of the elevation than the observation of the effect.

Good glasses and the sending forward of observers to within a closer distance of the object are also necessary for machine-gun detachments. Under certain conditions it will become necessary to deploy a whole chain of men, which connects a post of observation, sent out far to the front, or the infantry fighting at the front in the skirmish line, with the machine-gun detachment. These men are naturally compelled to lie down or utilize natural cover, but must nevertheless find ways and means to inform, by means of signals agreed upon, the machine-gun detachment of their observations.^a

In this manner only will the machine guns be prevented from firing too much ammunition without effect. It is also possible in this manner only to avoid endangering the troops in front by the firing of those posted in rear. Neither is absolute confidence to be placed in this system of observation. The machine guns must, in many cases, have recourse to the sweeping method, which naturally requires much ammunition.

^aThe English artillery had in firing over its infantry—which, as known, Lord Kitchener required of it in the words, that two to three shrapnel might hit their own troops, but no more—a mark in a flag, which was carried behind the infantry in order that the batteries could distinguish clearly the extent of their own attacking lines, which could not be distinguished otherwise on account of the method adopted during the course of the war of approaching in groups covered by the ground, often creeping, the intrenched positions occupied by the Boers.

QUESTION OF THE DISTRIBUTION AND USE OF MACHINE GUNS.

By Lieutenant-Colonel LAYRIZ, unattached.

technische Zeitschrift, Part I, 1905. Translated for the Second Division,
Staff, U. S. Army, by Capt. FREDRIK L. KNUDSEN, Eighth Infantry.

Officers occupied themselves as early as the year 1876
question as to which arm of the service machine guns
assigned, whether they should be put under the
ers to be disposed of by them or whether they
assigned in sections or singly to the smaller units of
the war of 1870 had demonstrated sufficiently that
ment to the artillery was not to be recommended.
ment to the cavalry seemed the most suitable, but
also in favor of the introduction of the weapon for
purposes in the infantry.

It of experiences in the Soudan and in the Boer war
tion of machine guns has been decided on in Eng-
en the infantry battalions and cavalry regiments.
continental armies the English example has found no

In the German army the machine guns are united
nd assigned to the jaeger battalions, in the French
e troops, and in the Russian a part of the machine
here "pullemetüj," has been assigned as an ex-
the infantry regiments and a part placed under
s and at their disposal. In Switzerland the ma-
belong to the cavalry, but are, however, not to be
an integral part thereof, but as at disposal. Since
ovisional use of machine guns has in Germany, as
and Switzerland, given place to a definite adoption.
of the machine gun, whether it is to be introduced
ny at large or form only a specialty, which is seen
appear in armies and disappear again, depends on
stands the test after it has been incorporated in

The experiences of the Russo-Japanese war are not yet ready to be judged, but it has, however, become known already that machine guns have given results on both sides. Concerning their effect on the Russian side at the beginning of the war, the Russian General Festorov writes in his article "The Machine Guns and their use in war" as follows:

"On April 20, 1904, a pullemtüj battery did good service in the action at Turentschen by firing on the Japanese attack against our left flank so effectively that these found themselves compelled to resort to intrenching. The same company covered later on the sheltering position which the Twelfth Regiment of Infantry had occupied. Although the company was given orders to retreat, it went once more into action, when it saw the desperate plight of the Ninth Battery. The pullemtüj company here inflicted heavy losses on the Japanese, but was itself very much reduced. One officer and 38 men were killed and all the horses. Thirty-eight thousand shots were fired all in all."

General Festorov also relates of the Japanese that their machine guns many times made it uncomfortable for the Russians. Thus, on May 17, two dismounted sotnias of Cossacks were compelled by machine guns to retreat.

The machine gun has still to overcome successfully some "childish complaints" of its technical development. It must further show that it can contribute to the decision in important stages of the action. This is doubtless the case of cavalry. Here there is only a question whether a light machine gun is not more suited to increase still more effectively the fire power of the cavalry without increasing the train.

The keeping together of machine guns in groups, which has been decided on in Germany, is best suited to the present condition of incompleteness. If a single weapon fails temporarily on account of technical imperfection, a large supplemental number is at hand for use. A selected, well-trained personnel knows how to help itself in the case of difficulties by means of a mechanic's expedients.

But otherwise the method of confiding, when introducing a new means of warfare, the use thereof to special troops is better for an army with compulsory service than the permanent assignment to existing organizations of troops.

ment of the short term of service everything which is their training must be kept away from the infantry and cavalry.

Organizing a special body of troops provision is made for a certain degree of skill in serving the machine gun. It is upon nevertheless fails in solving the problems for which it is created, it is then useless for war and disappears from the armament of the army without having disturbed one of the existing arms of the service. But if it turns out that the machine gun has become fit for use in war through improvements which it has undergone on account of objections on the part of the troops a considerable increase of machine guns is desirable for the army, and it is then tempting to resort to a system of concentration into organic organizations of battalions and to create, through the formation of independent battalions or regiments, a kind of a riding infantry. If we have gone this far, the idea of using machine guns in the cavalry is close at hand.

History has results to show in each arm. The troops are not likely to urge it. In the artillery, for instance, the battery commander will abhor sending away a single section, the group commander will protest decidedly against a separate use of his arm.

Regimental and brigade commanders of artillery are actuated by the same, purely human, endeavor to want to have in one position united all the guns placed under their command for which they are responsible. The massing, which is correct in most cases, but out of place in many, is treated in a purely subjective manner and laid down as the only method that applies in the employment until new war experiences make the system appear defective.

It is more logical than to use the machine guns in the infantry in many cases it will not fail of result. A mass of machine guns under Senarmont, at Friedland, dashed, as is well known, into the enemy's position within canister range of the enemy, and thereby decided the battle. Thus a mass of machine guns, with its ammunition wagons, might under special conditions of fighting succeed in causing a commotion in the enemy's position, which the infantry or cavalry would utilize to decide the battle.

It is hard to really think that such a use of machine guns is the rule under the effect of the enemy's artillery,

although it is very convenient for peace maneuvers and lightens much the duties of the umpire.

If the introduction of machine guns in masses does not take place and the organization of small groups is adhered to, this has also its disadvantages. If groups are put under the commanders of army corps, the principle of not burdening such places with the responsibility for special troops is abandoned. The corps or reserve artillery, which has shown itself as unsuitable, was also a movable fire reserve in the hands of the corps commander as machine guns are to be now.

The endeavor to introduce specialties has already been inflicted on the army before. In Bavaria in 1870 sharpshooters against *mitrailleuses* had been formed in platoons, which were always just where no *mitrailleuses* appeared. In front of Paris and Strassburg were introduced, for long-range fire, rampart shots who did not come up to the expectations. In front of Paris there were on the German side special shots against balloons, who were not present where balloons, on account of the course given to them by the direction of the wind, descended in the provinces far from the investing army; but the army sheds regularly, as the history of the art of war shows, such foreign growth from its organism. If machine guns stand the test and meet the need for which the effect of the existing arms does not suffice, they must be obtained in large numbers, and if it is not wanted to let them act as an individual arm on the same footing with those existing, then let them be at disposal as an auxiliary arm to the smaller units of the existing arms.

If we succeed in making the machine guns so light that they can be carried by one man, and consequently be able to follow the infantry everywhere, it would then even be conceivable to distribute them among the companies.

Machine gun detachments of large strength exist in time of peace as training companies for firing school purposes, in which officers and men are trained who are to serve as instructors in the infantry or cavalry and in which armorers, mechanics, and other specialists are to be instructed.

A distribution of the machine guns among the troops would mean in the case of their introduction in large numbers a saving as compared to the formation of special administrative units. The construction of machine guns will be still more

in the course of time. It is then quite possible to train infantry and cavalry officer so familiar with this weapon that he will be able to use it properly and conduct it among the men there are at present found so many in the ranks who have been employed in factories that there will be a great number of people who, besides the qualification of being soldiers, have also the advantage of understanding how to handle machine guns properly.

Assignment to the infantry of weapons which are mounted on wheeled vehicles and which need draft horses for transportation always meets with difficulties. It is therefore to assign to the artillery the material movable on wheels. It is, however, considered proper in case of necessity to attach it to the cavalry. The infantry must become used to regard the ammunition wagons just as indispensable to the fire fight and their driving by infantrymen as evident as the artillery has made itself independent in the transportation of its guns and ammunition. The bringing along by infantrymen of machine guns on two-wheeled carriages or in wagons will then no longer be laborious.^a

As to the distribution of machine guns among the troops are the difficulties which arise in this connection. The movements of troops in time of peace concerning the effect of machine guns. The massed use of machine guns exceeds the duty of the umpire. The time when machine guns become effective can not be easily fixed. It is consequently to judge, according to the conditions of the ground, from a station permitting a view, whether and how machine guns or machine guns have come into action. This is difficult to discover when the machine guns come into action in small units covered by the ground as in war, and are used for a short time only, but intensely so. In war machine guns can by being so used decide the partial engagements whose results the total result of the fighting troops is determined, but how difficult it is to obtain in time of peace the

to succeed in making the machine guns so light that they can be carried by a man, the adoption of such a weapon for the infantry, besides the fact that it would necessitate so large a number of ammunition wagons drawn by horses that the assignment of horses to the infantry detachment would be

basis for the correct judging of the result where the striking proof of the number of dead and wounded on the side of the adversary is lacking! In war the effect not only depends upon the number of the arms brought into action, but, aside from luck, on the skill in estimating the distance, in observing the shots, and in a proper method of firing, all of them matters which can not be ascertained by the umpire.

Similar difficulties in the rendering of a decision that estimates correctly the effect, confront the umpires on the appearance of artillery in maneuvers. Here also the "rage for numbers" can be spoken of. As a matter of fact, however, from peace training can be learned for war purposes only what has in some way brought an approximately correct conception of what pertains to war, either by personal experience or by means of imagination.

But it can not be denied that the assignment of machine guns to the small detachments of infantry is a logical result of the fighting problems devolving on them in war. This is not avoided through the sneering about "infantry guns," "push-cart artillery," "dog guns," etc., as they have been called. The depreciative attitude of the German army against the English system must be explained in another manner.

In an army which is raised by voluntary enlistments this system of assigning machine guns to the lower units of infantry or cavalry is justified, and it is not embarrassingly felt. It is quite different in the case of armies with compulsory service. Here simplicity of training is paramount. The administrative unit is also to be considered as the unit for training. In case of war they supply the nuclei for similar new units to be formed. The mobilization of the infantry and cavalry would be complicated by such a heterogeneous element as machine guns on wheeled carriages are. It would be quite possible to unite a larger number, about 10 to 12, machine guns, with wagons, personnel, etc., into one body, whose complement of men and horses would correspond, as an administrative unit, to a company, squadron, or battery. The analogy should naturally not be carried so far as to want to use these bodies as tactical units also. They would be much too large for this purpose. The new experience would soon be gained, which ought already to be evident from the French use of the *mitrailleuses* in 1870, that all large bodies

composed of groups of men and vehicles drawn by too clearly visible and therefore inferior to the machine gun is superior in effect to the machine gun at long

utilization is desirable in the tactical use of the machine guns on wheeled vehicles. Two machine guns produce a sufficient effect in most cases where they are

But the delicate construction of the weapon must be taken into consideration. Since trouble can easily occur at the decisive moment, a reserve must be provided for the machine gun. For this reason 4 machine guns are brought into action, even when conditions of space and ammunition permit of only 2 firing. Two will then be in reserve of action as a reserve.

In exceptional cases it will happen that several groups of machine guns can be united, because the nature of the ground makes it possible to approach under cover close to the position to protect the distribution of ammunition behind this position. Such a massing is valuable on the defensive, in holding advanced positions or as flank against enveloping—and is so simple that it does not oppose a consolidation into larger peace units.

It is at all indicated that a duel action will be fought between two groups of machine guns, in which the leaders will show the superiority by means of the number of guns. The inevitable object can be imagined for machine guns of the enemy. Both would expend their ammunition for no purpose against each other and could no longer be used for more important tasks. The machine gun is superseded by means of artillery.

More dangerous to machine guns than similar weapons on the enemy's side might become individual shots, who creep up at range and disable with an accurately-aimed individual shot the leaders or cannoneers. The machine gun must therefore use a large personnel in order to protect itself from such undertakings.

Problems for the machine gun, after the introduction of the machine gun as the armament for the infantry, are still to be solved.

Machine guns are already called upon at the present time for their development to play an important rôle in cam-

paigns. A larger one falls to their lot when they are made so light that they can be carried by one man under all conditions.^a

But the machine gun gains in importance even by the introduction of a self-loader for the infantry. The great rapidity of fire which this permits would cause the pouch ammunition to be consumed too early in long-range fire. When the long-range fire is taken over by the machine gun, the principle that the mass of the infantry is to advance in the attack without firing to within the zone of the short sights from the enemy can be carried out more easily.

The approach of the infantry attack by advancing to ranges closer than 400 meters is made possible by the fire of machine guns from 1,400 meters against everything visible on the enemy's side by making difficult for him the conduct of fire and delivery of aimed fire. Machine guns are in the case of such a use not intended to replace guns. The artillery has, in the future as in the past, the principal task of keeping down the enemy's artillery as soon as this appears for firing on the infantry and to help its own infantry through the last difficult moment, when all the infantry on the enemy's side opens fire for a repulse.

Until the invention of the bayonet the armament of the infantry was different for long-range and short-range action. A distinction has again become necessary, because what was formerly a matter for the pikemen has now become the task of the short-range skirmish fire.

The hitherto-existing twofold use of the rifle for short and long range fire is somewhat fascinating. But it does not suit so well the nature of the infantry action as did the simplification of the armament by adopting the bayonet flintlock in the time of the smooth-bore muzzle-loader the requirements of long and short range action at that time.

Let us stick to the fact that only the élite among soldiers is capable of beginning the fire at long range and retain its composure for short-range fire. It further remains to be considered that long-range fire in the attack means loss of time and that the short-range action then loses the advantage of sur-

^aA machine gun of that kind without cooling jacket only about 2 kilograms heavier than the infantry rifle has in Denmark been introduced in the cavalry and is also to be adopted for the English cavalry.

The skirmishers of the attacker intended for short-action do better in lying down entirely flat on the ground during the pauses which must arise in the advance than to reply with an ineffective fire to that enemy, and thus present to him a favorable target in the head targets. The long-range fire is then left to the guns. They follow at the proper time the rearmost lines in échelons in order to serve as a fighting force of keeping the captured position. The machine gun helps in saving men in the attack who are intended as for the last shock.

Machine guns are therefore to help the attack by means of trajectory fire with small-caliber projectiles through the tactical moments, while the artillery must prepare itself for supporting it by means of high-angle fire up to the last

In the solution of all defensive problems it is the business of the skirmishers, deployed in thin lines and armed with (fully portable) machine guns, to take the place of the mass fire at long ranges, when, besides the artillery long-range infantry fire shows itself to be necessary; but as the short-range fire remains the principal thing.

Modern war has not first shown that the machine gun has great effect, as this was already known from the experience of 1870 (Beaune la Rolande). The machine guns take great effect on the defensive in this short-range fire, and just as concentrated fire is especially needed—for instance, in the attack.

The presupposition for such a use of infantry fire for long-range action is the placing in readiness of sufficient ammunition. This will be difficult, especially in the attack. The reserve of the reserve ammunition is, however, the most important means the higher leaders have for keeping control of the course of the action.

The loss of men in bringing up ammunition to the firing position in the future be decidedly greater than heretofore; the method of bringing up ammunition must also be different from that used formerly. As an innovation comes into the assignment of a train detachment to the infantry units. The tactical training of the drivers of ammunition wagons is so important to the infantry that it must itself

take it in hand. Officers or noncommissioned officers would only have to take care of the training in the art of driving.

After the introduction of machine guns as armament for the infantry, especially when it takes place alongside the self-loader, no warlike exercises of the infantry are to be carried on without assigning ammunition wagons. The decision of an umpire, as the *critique* of the commander, is always to be founded on the consideration whether the arrangements have been so made that in war ammunition would have reached the firing line in sufficient quantities.

The machine gun is perhaps more important to the cavalry than to the infantry. It can also be used by it in its present condition, since a further addition to it of a mounted arm matters little to it, whether it be that the present machine gun is loaded on pack animals or on wagons (Switzerland, Germany).

Besides machine guns, machine cannon^a are also advantageous to the cavalry. Their number need not be large, but their mobility must be such that they can follow the cavalry still better than the gun of the horse artillery.

The lesson is drawn from the South African war that the decision in the attack must be prepared by enveloping the flanks and by acting against the rear of the enemy's position. This requires the sending out far to the front of cavalry masses, which will thus encounter hostile cavalry.

The victor in a cavalry engagement would risk the result of his success if, as cavalry, he should attack with cold steel, according to the hitherto existing idea, infantry and artillery in the principal position^b with the present armament, and still more after the introduction of a self-loader such attacks, which have not been prepared by fire effect, have no prospects of success.

Horse artillery, machine guns, and machine cannon, attached to the cavalry, provide this fire effect. The dismounting of the cavalymen for the skirmish fight can often

^a By this term is understood the so-called "pompom"—that is to say, the Vickers-Maxim 5.7-centimeter automatic and the 7.62-centimeter semiautomatic gun.—Translator.

^b There enters, besides, into consideration the degree of exhaustion which will certainly manifest itself after a previous ride of long duration, and a cavalry engagement fought out, in which the units have been split up and must be reformed, which deprives the attack of compactness and rapidity—in short, of all the elements of impetuosity.

ded in order that the machine guns and machine
y be able to fire on the principal objects and not
her with the fighting of a few thin skirmish lines,
red by the ground, try to advance on them. But
dy of the cavalry can remain assembled and keep
for turning to the best advantage the result of the
y means of a mounted charge.

g machine guns attached to it the cavalry will be
becoming mounted infantry, and still it will, as
rough its action contribute its share to the bring-
the decision, which it does to the fullest extent in

he noise of the fire fight on the flanks and in rear
y the parts of the enemy's army involved and
o a shattering of his morale, which will manifest
creased resistance against frontal attacks.

ns drawn from the failure of the *mitrailleuses* in
1870 as to the worthlessness of modern machine
t admissible. There exists between the two an
fference, which should not be overlooked. The
s were, according to their nature, suited to short-
n the defensive. They proved that in 1870 when
aced under cover, although they lacked the neces-
ing arrangement for a canister effect. It was a
edure to use them instead of artillery or in con-
erewith for long-range fire, since they could, on
their unsuitable carriages, not exert their effect
a as a field gun.

ern machine guns^a are well suited to long range
they are able to take cover in the ground, and
not have to expect to be silenced so prematurely

ity of their cone of projectiles is valuable in this
se it makes possible the firing over advancing
In this respect the machine gun, provided with a
e against short striking shots, is to be preferred to

n machine guns (pullemetüj) are not provided with sledge car-
represent on their wheeled carriages with protective shields a con-
to the enemy's artillery. Their fiasco at the Yalu therefore does
st the usefulness of machine guns.

the flat-trajectory gun, in the case of which a wrong timing of the fuse must always be reckoned with.

Neither does the failure of the machine guns used on the English side demonstrate that they are worthless to the army. The German machine-gun construction is to be valued differently from the English. Here the carriage problem has been better solved. The German machine gun with the portable sledge carriage makes itself less conspicuous than the English, which was not able to follow the infantry.

In a war between continental armies opportunity for using machine guns effectively against massed objects will occur, while in the South African war the thin, well-covered Boer lines presented unfavorable objects. But a step forward would still have been taken if we should succeed in making machine guns dispense with the cooling jacket.^a

In order to determine correctly the value of machine guns in small groups, it must be realized that in war the different arms carry on the principal action in masses. Their attention is so fully occupied with this that such dangerous but easily hidden troops as a machine gun group easily escape observation. They are therefore able to act by sudden attacks, consequently by surprise.

A high ranking English naval officer has made a striking comparison by pointing out that machine guns would be called upon to take the place in land warfare which falls to the torpedo in naval warfare. As the large battleships are able by watchfulness to protect themselves against this only until the action against the enemy's ships presents an opportunity to launch the torpedo, so the best chance of effect for machine guns in land warfare would come when the large masses are struggling, duel like, for the decision.

^a In the Danish machine gun, Madsen system, capable of being carried by one man, success seems to have been attained in dispensing with the cooling apparatus. With a large number of machine guns they can be used alternately, so that the cooling takes place through pauses in the firing.

REGULATIONS FOR MACHINE-GUN BATTERIES.

Adapted from the official regulations of the German Army (1904).

Translated for the Second Division, General Staff, U. S. Army, from the German, by
Chaplain PAUL T. BROCKMANN, Twenty-ninth Infantry.

PART II. THE ENGAGEMENT.

INTRODUCTION.

The utility of the battery in the engagement depends upon the perfect mastery of the formations and movements treated in Part I.

The influence of the battle, with which the troops become familiarized in the exercises, necessarily effects the engagement advantageously. The effect upon the men depends upon their moral worth. To increase the latter is, therefore, one of the chief aims of the instruction in time of peace. All instruction must make for this end and also the maintenance of discipline to be used. The chief of these is the *absolute maintenance of the tension when executing the formations and movements.*

Attention must be paid in even the smallest matter in this direction to the requirements of war.

In the exercises as nearly warlike as possible battery commanders must select formations which will enable them to meet the object of the engagement and to use to advantage the natural conditions of the territory for purposes of the engagement. The selection must be made with the view of *increasing the effect of his own fire* to the greatest extent and diminishing the effect of the enemy. *The former consideration governs in the selection of formations.*

Formations and principles contained in the regulations apply to the simplest tactical conditions, which in war are constantly changing. The process of the battle, however, will produce tactical conditions which no generally applicable instructions can be adapted to.

The course of the instruction is from the easy to the difficult. At first, therefore, instruction is given in favorable tactical conditions.

territory which can be easily overlooked; later on in difficult territory. At first the assumed conditions of the engagement are very simple. Gradually, however, more difficult conditions are introduced, including severe losses of men and material.

219. The conditions prevailing in time of peace compel us to give a great part of the instruction for battle on the drill ground. At places where the formation of the drill ground is unfavorable variations can be made by assuming partitions, passes, etc. *The use of such auxiliaries must be made in very simple and readily apprehended forms.*

Whenever instructions for battle are to be given the troops must so be informed.

220. Besides the exercises on the drill ground instructions must be given on other territory. At inspections, also, a change of territory is advisable.

221. Exercises held in conjunction with other branches of the service are of particular benefit to machine-gun troops.

Machine-gun batteries must therefore be given as many opportunities as possible to take part in such exercises, particularly in conjunction with infantry.

222. By marking the positions of the enemy and those of his own troops the officer giving the instruction will be enabled to present the progress of the engagement all the more clearly.

GENERAL PRINCIPLES.

223. Machine guns enable the general to bring into action at certain points all the effectiveness of infantry fire on the smallest space.

The guns can be employed in all territory suitable for infantry and must be able—when dismounted—to pass even difficult obstacles. In battle the object which they offer to the enemy is no larger than that offered by infantry troops under similar conditions, and with reference to their fighting ability they are much less liable to losses than infantry.

When executing movements on the battlefield, which must be executed as soon as the enemy's fire is to be expected and in which the dismounted guns are moved by dragging or carrying, all cover suitable for infantry may also be used by the machine guns.

at is scarcely large enough for a platoon of infantry
an entire machine-gun battery.

struction of the carriages, on which guns, ammuni-
men are transported, and the draft power of the
e the machine-gun battery on a par with mounted
ar as marching ability is concerned.

carrying power and effect of the machine gun is
infantry rifle. The rapid succession of shots and
d hits, the small angle of the cross-fire, the possi-
embling a number of guns in a limited space enable
e-gun battery to obtain a complete success and to
disastrous fire even at long range at large and
jects.

guns are little suited for conducting long continued

hine-gun batteries generally avoid a conflict with
whose firing line is protected by good cover. Such
requires an expenditure of ammunition out of all
to the number of hits made. In such cases the
be withdrawn temporarily and reserved for the
ments.

are machine guns suited for an engagement with
ns, the object being hard to hit. In the majority
ill be found to be of advantage to have other arms
hine-gun fire. If not, a careful reconnoissance of
s position must precede.

machine-gun battery can at all times meet a cav-
with repose. Any formation will be found serv-
epulse it, provided it enables the battery to direct
ley fire into the cavalry. The fire is to be distrib-
he entire advancing front, whether the guns are
dismounted. Particular attention must be given
y's following lines, their own flank, and the protec-
carriages in case the latter are separated from the

territory machine-gun batteries can safely advance
ard to hostile cavalry so long as the latter is not
uch superior numbers that it can attack simultane-
different sides.

o a fight with artillery it is to be noted that the
rity is with that weapon at a long range. If

machine guns are used to fight artillery, they must be dismounted and brought as near to the artillery as possible. The high mobility of the horse battery will occasionally enable it to open the fight by a flank attack, thus essentially increasing the effect. A fan fire distributed over the entire firing line of a battery is unpractical.

229. As a rule machine-gun batteries are not broken up. For special purposes single sections may be made independent. The battery commander controls the distribution of the ammunition wagons among the different sections. *Employment of single machine guns is prohibited.* A temporary combination of a number of machine-gun batteries will be of advantage only in *exceptional* cases. The ranking (senior) officer exercises command over all the guns.

230. In consideration of the manifold occasions on which the machine-gun battery may be employed and also for the purpose of diminishing its dependence on other arms of the service, it is practical to attach a number of mounted men to it permanently according to the *Field Service Regulations* (No. 121). Otherwise the preparations for action on the part of the machine guns are such that an escort is needed only in territory that can not be overlooked. In such territory it may be necessary to attach small escorts of infantry or cavalry to the machine guns to secure their flanks and rear and to protect the carriages. Requests to this effect made by a battery commander to a commander of infantry or cavalry stationed in the vicinity must always be granted.

231. *Machine guns can never take the place of artillery. They will be employed mainly on occasions where the rapidity of their fire, their mobility (on the march), and their ability to disappear in the terrain separated from their carriages, can be fully utilized.*

232. *A careful knowledge of the conditions in general, of the intentions of the general, and of the status of the engagement are necessary requirements for a correct employment of the machine guns. The disposition of the machine guns, therefore, rests immediately with the highest officer in command. If machine-gun batteries are attached to a particular body of troops, it will be possible to utilize them to their fullest extent in exceptional cases only.*

LEADERSHIP.

commanders must modify their commands quickly without hesitation to suit existing conditions. They must be in mind that omission and procrastination are more injurious in their results than a mistake in the selection of

at the opening of the battle the battery commander must inform the commander of the troops to which his battery is assigned to receive his orders. It is his duty, if occasion requires, to request employment of the machine guns. He must be in communication with the officer in command at the engagement, keeps the latter advised, and must furnish information concerning the progress of the engage-

RECONNAISSANCE AND CHOICE OF POSITION.

The attainment of the greatest fire effect governs the choice of the position for the guns. Considerations as to the position are of secondary importance.

Every position must be reconnoitered previous to its selection. A timely and well-executed reconnaissance is a necessary condition of success. It embraces ascertainment of the tactical value of the territory which is to be occupied by the battery, knowledge of the roads of approach and their condition, means of securing the troops against surprise, and the signs given in No. 8 will aid in transmitting orders.

When marching forward or when in a defensive position the battery commander reconnoiters himself. When in a defensive position, the battery commander remains with his battery as long as it is in the zone of fire, but directs a senior member to reconnoiter. Before taking up the position the battery commander, if possible, must himself have examined it. He must not draw the enemy's attention to the position. The attendants are therefore left behind and examination is made on foot.

The following qualifications are desirable in a position: a clear field of fire on which a good fire effect is possible up to within the shortest range; a firing line at right angles to the line of fire; sufficient space; cover obstruct-

ing the enemy's view; fair condition of the ground at, and to the rear of, the firing line.

240. Positions close to or in the same height of objects the range of which is known to the enemy are to be avoided. Nor is it advisable to choose a position in the vicinity of prominent objects, much less a position in front of them, because they aid the enemy in finding the range; but a position in front of a dark background or on territory covered with suitable growth will make it difficult for the enemy to find the range.

Every kind of mask, even that of artificial construction, hinders the enemy's observation.

TAKING POSITION FOR FIRING.

241. *When moving forward and when taking position, the security of the battery must never be lost sight of. If the flanks are threatened, particularly in difficult territory, the officers commanding the rear troops send out scouts. The scouts are not to advance as far as possible, but must keep in touch with their troops. When moving forward, roads are utilized as much as possible.*

242. The gait and dismounting of the guns depend on the plans of the officer in command, the condition of the engagement, the condition of the territory, and on that of the ground.

243. Directions concerning the taking of the position must be given in time, so as to avoid delay in opening fire. *Particular efforts must be made to take position under cover and to surprise the enemy by sudden opening of fire.* This, however, is possible only if particular attention is given to cover while marching to the position and the enemy is in doubt as to the contemplated position. If cover is wanting or if the battery is to go into action without delay, the commander must endeavor to surprise the enemy by the rapidity with which he takes the position and opens fire.

244. The position of each gun is chosen with respect to its fire effect and cover. The interval between the separate machine guns is, as a rule, 20 paces; but it is not necessary to maintain alignment and intervals. It must be borne in mind, however, that the losses caused by the enemy's fire will be greater if the guns are placed in close proximity. The guns must not hinder one another in firing. It may be of

e, if the flanks are threatened, to form the guns in

ver the condition of the territory or the peculiarity
get necessitates a more careful choice of position, it
le to employ the detachment leader (under circum-
so the gunners) for reconnoitering purposes.

OPENING AND CONDUCTING THE FIRE.

he decision to open fire must not be made hastily.
e remembered that the fire of machine guns is of
effect only if poured on an enemy who is clearly
e zone of fire. It is immaterial what kind of weapon
y employs. The choice of the target is dependent
etical importance at the time. The fire will next
ed against objects which, because of their height,
ealth, and density, promise a high percentage of

is not permitted to shoot over the heads of friendly
less the nature of the territory permits the forma-
veral firing lines one above the other.

ring at night will be successful only if the guns have
ated during daytime at places where the enemy is
or if the objects fired at are illuminated, as, for
bivouacs with fires, etc.

must be remembered also that the ammunition sup-
ted and that the expenditure of a certain amount of
ion represents an expenditure of power which must
only when justifiable.

*ever, it has once been resolved to take a certain object
then the ammunition necessary for the attainment of
of the engagement must be expended without stint:
sufficient effect weakens the moral element of ones own
ile strengthening that of the enemy.*

he enemy will feel his losses all the more if they are
in a brief period. In most cases it will therefore
ble even if engaged with a weak enemy to open fire
one or two sections, but from the entire battery.

a cases the expenditure of ammunition would prob-
qual, but the losses of the battery will be less heavy
er case.

250. A change of targets is made only when the guns have been completely successful in their firing at the former object. Frequent changes of targets weaken the fire effect and are therefore to be avoided.

251. It will not always be possible to avoid a distribution of the fire over several objects; but the distribution of the fire must not degenerate into a *useless, ineffective division* of the fire.

252. Presence of mind, readiness for action, perfect fire discipline are required to insure the attainment of a complete fire effect. The fire discipline must be maintained even though many leaders and men are disabled in the course of the fight. If the troops are well instructed, the presence of mind of the individual and the example of particularly cautious and courageous men guarantee a successful continuation of the fight against an enemy whose situation is equally difficult.

ACTIVITY OF COMMANDERS IN BATTLE.

253. The officer commanding the troops indicates the target in a general way by designating the object of the engagement.

254. The battery commander chooses the position, gives the range, indicates the separate objects and the kinds of firings, and commands the opening of the fire.

255. The chief of section transmits the commands. He designates the positions, the parts of the objects, and the range for the separate guns. He supervises the service and is responsible particularly for the correct apprehension of the object and the firing activity of his section.

256. The detachment leader selects the most favorable position for his gun, designates the elevation of the gun at which aim is to be taken, supervises the correct execution of all commands, and, if occasion requires, sees to it without command that the fire is effective. He is responsible for the proper handling of his gun and keeps his eye on it, in order to insure its constant fire activity.

257. If the subordinate commanders act independently within their limits, and the distances are correctly estimated, and the conditions of the weather are taken into account, it will not be necessary *to interrupt the firing activity of the bat-*

for the purpose of correcting the sight and aim. Interruption of the firing activity is particularly to be avoided if firing targets that will in all probability soon disappear. No must be lost by describing such targets in detail.

Well-trained battery is expected to recognize the object of fire and to distribute the fire properly, though the given distances are short. If a portion of the enemy is disabled or has disappeared, the fire is aimed independently at the remaining portion which continues to offer resistance.

The posts of the commanders are important, both with regard to giving commands and directing the fire.

When giving instructions in time of peace, all commanders give their commands from that post which they would occupy in an engagement. The commanding officer may authorize such variations from this rule as he may see fit.

Men must be absolutely prohibited from exposing themselves more than is necessary to observe the battlefield, serve the guns, transport the ammunition, and measure the distances.

THE CARRIAGES.

When the battery is engaged in battle, all carriages, as well as the guns, are left under cover. If the battery moves forward, the mounted guns and ammunition chests are transported by the men.

It may occasionally be advisable to hitch a couple of lead horses or a single horse in front of the gun or the ammunition chest.

In that case a man walks alongside each gun and ammunition chest to prevent the chests from overturning and to assist in passing obstacles.

Uniformity in the battery is not required. A uniform advance into the position for firing must, however, be attempted.

Mounted guns must not be removed from cover unless the conditions of the battle absolutely require it. In that case the guns are sent to the rear in the direction of the ammunition train as soon as the guns are dismounted.

Whether both groups unite or whether the carriages remain close to the guns depends upon the security and the distances. In every event territory all carriages must remain as close to the firing battery as the fire effect of the enemy's guns will permit.

When cover is lacking, it is advisable to form a single column in rear of one of the flanks of the battery.

If the carriages have sufficient cover, any formation is permissible, *provided it enables them to quickly leave their position.*

260. The officer in charge of the carriages must remain in constant communication with the battery and follow its movements as much as possible, even though he receive no orders to that effect. He reports every change of position.

He is particularly enjoined to maintain the highest degree of discipline and order. Every disorder among the carriages in the rear of the firing line may result in the most terrible disasters by obstructing the roads and narrow passages.

The carriages secure themselves against surprise attacks by means of outposts.

AMMUNITION SUPPLY.

261. *Timely renewal of the ammunition supply is of the utmost importance. It is the duty of every commander to regulate it. The officers and men charged with renewing the exhausted supply must make the utmost efforts and employ all means to keep the firing line constantly supplied, even though no order to that effect be given.*

262. When the guns are engaged in combat, the commander of the carriages sends filled ammunition chests and takes the empty chests to the rear, and *has them refilled as soon as possible from the ammunition wagon.*

263. The approach of the respective ammunition columns^a will be regulated by general orders; if the ammunition columns are attached to divisions, then by the division commander.

The battery commanders may ascertain the place and time of the arrival of the columns and can request that the wagons containing machine-gun ammunition be brought forward.

In urgent cases the wagons are brought up to the carriages of the machine-gun batteries in action.

264. If the ammunition supply cannot be renewed otherwise, the infantry and cavalry will help out.

^a Cartridges for machine guns are carried: (1) by the light ammunition columns of the cavalry division; (2) by those ammunition columns of the infantry army corps whose wagons are marked by a red line. (All infantry ammunition columns of the Bavarian army corps carry the cartridges.)

SUPPLY OF MEN AND MATERIAL.^a

Supplies of fresh men and material are furnished continuously with the renewal of the ammunition. Every machine-gun battery must strain all its powers to the utmost to utilize every possible means to maintain its readiness for action and its mobility.

The chiefs of section and the chiefs of the carriages must see to the attention necessary for furnishing supplies and making repairs.

Every man must have received careful instruction in making repairs.

No attention is paid to injuries and losses which do not absolutely deprive the gun of its mobility. The object is to change the position as quickly as possible.

If a gun or carriage has been disabled in a forward movement, the chief of section or the chief of the carriages must give the necessary directions for bringing up the gun or carriage. The section continues the forward movement with the service of the section or of the carriage, as the case may be. When moving to the rear, the chief of section, unless directed otherwise, *personally* sees to it that no *gun* is left behind.

Under certain circumstances the damaged material must be brought to the rear with a diminished number of men or by the men themselves.

THE ATTACK.

A distinction is to be made between the attack resulting from meeting with an approaching enemy and the attack on an enemy who has already developed his troops.

When meeting an approaching enemy, the advance must secure time and space for the main body to form.

As the solution of this problem essentially depends on the advance taking and holding favorable positions, it will frequently be advisable to attach machine guns to the advance, even when it consists of cavalry.

When the infantry has arrived, the machine guns are withdrawn from the firing line as much as possible. They are kept in readiness for other employment.

The first echelon of the ammunition column is supplied with a reserve machine-gun battery.

272. When the attack is made on a fully-developed defensive front, the machine guns will, as a rule, be kept in the rear. They constitute a reserve of great mobility, which can be advantageously employed in supporting threatened places, attacking the enemy's flank, and preparing the charge.

A contemplated attack can only be successful if the fire superiority is gained.

The machine guns are, therefore, sufficiently mobile to follow the attacking infantry. To execute the rushes of the infantry is as little required of them as it is for them to take part in the charge.

An adept and cautious leader will always be able to approach the enemy close enough to take part in the battle at the decisive moment.

The temporary separation from the carriages must not deter him.

If a certain portion of the enemy's line is to be taken under fire, preparatory to the delivery of the charge against it, it will be of great advantage to deliver the fire from a high position or from the flank. In those cases the guns can continue their fire while the infantry continues its forward movement and prepares for the charge. If such a position has been gained at a distance which insures the greatest fire effect (about 800 meters or less), a further advance would be a mistake. It would lessen the fire effect and would necessitate a new alignment and the finding of the new range.

273. If the battle is successful, the machine guns must take a prominent part in pursuing the enemy. They advance rapidly to the captured position in order to support the infantry in holding it and to destroy the last resistance of the enemy.

274. If the attack fails, the machine guns cover the retreat of the troops.

THE DEFENSE.

275. When employing machine guns for purposes of defense, it must be borne in mind that the guns are not suited for long drawn-out engagements and that in such engagements their great mobility can not be utilized if they are directed to defend only a certain portion of territory.

It will, as a rule, be advisable also in defense to keep the machine guns with the reserve for the first and to use them

ity demands for strengthening the line of defense at weak points, preventing flanking movements, resisting assaults, or executing offensive movements.

It does not preclude their employment at the beginning of a battle, for instance, in obtaining and keeping control of the enemy's approach.

It is also possible, in case a withdrawal of the guns under cover is assured, to place machine-gun batteries in front of the flank of the main line of defense in such a manner that they can take that part of the territory in a surprising manner under fire in which the enemy will probably place great value.

Sometimes machine guns can be employed from the flank at small lead angles under fire.

Provisions must be provided for all positions which have previously been assigned to machine guns. If time is lacking, efforts must at least be made to construct masks, to clear the field of fire, and to measure the distances.

THE PURSUIT.

After a successful combat the machine-gun battery must not be used in the most inconsiderate manner for following up the victory. For this employment they are eminently qualified, combining, as they do, firing ability with mobility. The enemy must be pursued until the pursuit is completely exhausted. The machine guns advance to the most effective firing distance and break down the efforts of the enemy at rallying or intrenching. A fire delivered from the flank is particularly effective. A plentiful supply of ammunition is necessary for an energetic pursuit.

THE RETREAT.

In case an engagement is broken off, or when it has been unsuccessful, the machine guns can be of great service in following the enemy, without regard to the probable position of the guns, and pouring a deadly fire into them. Positions in the rear of passes or positions from which a retreat is possible are particularly suited to detain the enemy. Particular attention must be given to the ammunition and to reconnoitering roads of retreat, and correctly choosing

ing the time of beginning the movement, especially when it is to be executed in échelon.

In order to avoid jams, the ammunition wagons must be sent off betimes.

Great attention must be given to the flank, for flank attacks are disastrous to the retreating army.

Suitable flank positions, if they are possible, will greatly relieve the retreat.

BATTLE IN CONNECTION WITH INDEPENDENT CAVALRY.

279. Machine guns attached to independent cavalry are to assist the cavalry, mounted and dismounted, in the attack and in the defense.

The demands made upon the machine-gun batteries require *great mobility and highest fire discipline*.

280. The chief of the independent cavalry controls the movements of the machine guns. He communicates his plans betimes to the battery commander and gives him the necessary directions, particularly as to the first active participation. It may be advisable, in case the machine guns are not to be employed, to let them take up a position suitable for protecting a possible retreat.

281. When the territory is to be cleared of the enemy, machine guns may be profitably employed in breaking down the resistance which the enemy offers at passes, or they may be employed to strengthen friendly positions. Occasionally a single section with an ammunition wagon attached to cavalry divisions will be of service.

282. When a forward movement by the cavalry is contemplated, machine-gun batteries must be placed in position as early as possible in order that they may support, first, the development, and then the attack. A position somewhat to the front and to the side of the advancing cavalry is the most suitable, because it enables the battery to continue the fire uninterruptedly up to the moment the troops clash, and to prevent the enemy from executing a turning movement. It is desirable that the position be protected against a direct attack. This, however, is of secondary importance compared with the fire effect. Owing to the brevity of cavalry engagements a change of position is seldom made.

is not advisable to separate the individual sections, for increased firing lines limit the movement of the cavalry.

forward movements of the horsed battery the distance must not be less than 10 paces, for closer intervals are difficult to drive the limbers quickly to the rear.

On frequent occasions will occur in the course of the battle where the battery commander will have to act independently. He must not wait for orders directing him. He must, therefore, watch the combat closely, and take part in the engagement at every opportunity, and make necessary preparations for protecting the retreat or the enemy, as the case may be. It may at times be necessary to wait with guns in marching order.

It is of the utmost importance in case the combat is successful to pursue the enemy and prevent him from making renewed resistance.

When the fight is unfavorable, the battery commander must decide betimes whether to remain in his position or take a position toward the rear to protect the

flank to the peculiar nature of a cavalry engagement. It is often necessary to keep the carriages in close proximity to the guns or to fire with guns mounted.

The presence of carriages offers the enemy a favorable target and hinders the guns from firing toward the rear. The battery commander may have to decide whether to keep the ammunition wagons under cover or not.

Machine-gun batteries, which have been attached to the divisions, belong to them also in battle. Owing to the manifold duties of the cavalry they will find frequent occasions to be of service during and particularly after

the battle. Machine guns may also be used to advantage in the support of artillery batteries if other troops are not obtainable.

VE FIRING REGULATIONS FOR MACHINE-GUN DETACHMENTS.

om the German for the Second Division, General Staff, U. S. Army, by
Capt. JACOB F. KREPS, Twenty-second Infantry.

on the report submitted to me, I approve the fol-
tentative Regulations for Machine-gun Troops.
er tentative regulations are revoked. I authorize
nister to promulgate explanations of and to modify
regulations, provided the changes be not funda-
The war ministry will report to me the results of
nd tests of these tentative regulations.
ace, September 1, 1904.

WILLIAM.

VON EINEM.

WAR MINISTRY.

GENERAL REMARKS.

INTRODUCTION.

means of target practice with the machine guns such
proficiency shall be reached as is necessary for an
use of this weapon in battle. Therefore target
rms one of the most important branches of military
ich must be pushed on and advanced in all its
such a manner that the gunners at the close of the
f service will have been exercised and drilled in
tilated to war conditions.

he following time of service efforts will be directed
rovement and rendering permanent of what has
n learned.

nstruction is divided into preparatory exercises,
practice, and "battle-condition" practice.

THEORETICAL INSTRUCTION.

2. What is said in the Firing Regulations for Infantry concerning the theory of firing and fire-execution applies to the machine gun as well.

TARGETS.

3. Target frames are made of wood; coverings, of cardboard or linen.

4. Field target No. 1, 85 centimeters (33.46 inches) high, 350 centimeters (137.8 inches) wide; of gray color.

There are five divisions (fields) upon the target, each field 60 centimeters (23.62 inches) in length, pasted one to the other.

The fields are marked on the right and left by heavy perpendicular lines $\frac{1}{2}$ centimeter (0.2 inch) in width.

In the middle of each field runs a heavy horizontal line 1 centimeter (0.39 inch) in width, and 4 centimeters ($1\frac{1}{2}$ inches) above and below the middle line of this heavy line two light parallel lines are drawn.

The space between the light lines is divided into 75 rectangles by light vertical lines, each rectangle being 4 centimeters ($1\frac{1}{2}$ inches) wide.

Each rectangle at a distance of 25 meters corresponds approximately to a figure target (*Rumpfscheibe*) at 250 meters.

At the middle point of each rectangle a heavy perpendicular stroke (Anchor) 1 centimeter (0.39 inch) wide extends $\frac{1}{2}$ centimeter (0.197 inch) above and below the heavy horizontal middle line.

5. Field target No. 2:

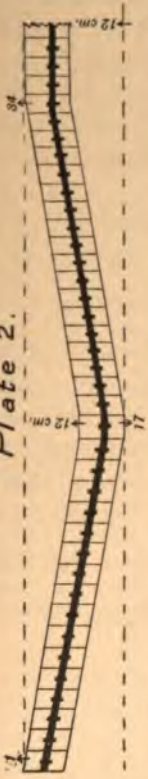
The target consists of 75 rectangles, such as are described above.

The rectangles 17, 34 to 41, and 58 are to be pasted together, the longer sides vertical, the shorter on the same horizontal line; rectangles 1 to 16 and 42 to 57 on an oblique falling line from the left facing the target; rectangles 18 to 33 and 59 to 75 on an oblique ascending line. The distance of rectangles 17 and 58 from rectangles 1 and 75, respectively, measured on the prolongation of the upper (horizontal) sides of rectangles 34 to 41 is 12 centimeters (4.72 inches).

Plate 1.



Plate 2.



FIELD TARGETS. (PAR. 3.)



sions of the rectangle are the same as in field targets. The targets are used to exercise the gunners in with the fore sight an object or target placed on end.

al exercises it is permissible, by variations in the placing the rectangles, to plant targets of new forms.

target 400 meters and group target 600 meters.

Targets correspond to the "section" targets, 400 600 meters. (*Firing Regulations for Infantry, No. 1* over, *Querband No. 2* is divided into three parts of by two vertical red lines, visible to the markers inner division is marked "3" and the two outer

figure targets and their varieties, *Firing Regulations, No. 28*, control.

RANGES.

ing out and preparation of ranges are in accordance orders."

al conditions do not permit of garrison orders mission to fire at 600 meters in the vicinity of the s practice is to be held on the ranges, drill grounds, localities.

TARGET AND LEAD MONEY ALLOWANCES.

"detachment" receives an allowance of 436 t money.

t and lead money allowance is to be spent solely est of the "detachment," not in that of the bat- ich it forms a part.

ey is appropriated for the purpose of procuring nning material, and wadding, for the purchase of ridges, ball and blank cartridges, and of firework rm targets similar to a battle line. Money from riation must not be expended for preparation, es.

us eventually remaining may be expended for the oncommissioned officers, soldiers, and horses at maneuvers, etc.

The disposition of this money allowance is under the control of the "detachment" commander. The uses to which it has been put will be reported in detail.

AMMUNITION.

10. In advance, the ball ammunition allotted to a detachment is to be divided as follows:

I. For "battle-condition" firing, 60,000 cartridges.

II. For "test" firing, 6,000 cartridges.

III. For practice with the carbine (see Appendix, *Firing Regulations for Infantry*) for each individual, based upon the strength assumed in computing the ammunition allowance, 75 cartridges.

IV. For the special practice of officers with the carbine, 500 cartridges.

V. For the prize competition of noncommissioned officers with the machine gun, for each noncommissioned officer, 250 cartridges.

VI. For the "gun-test" firing of the machine guns and carbines, 1,000 cartridges.

VII. For the purpose of giving instruction, 1,000 cartridges.

The remaining cartridges are allotted for "school" practice with the machine gun.

Savings in ammunition allotted for "battle-condition" practice and for the special firings for officers must not be made. If such savings be made unexpectedly, the ammunition saved must be used during the next practice year. On the other hand, ammunition saved otherwise may be used in the "battle-condition" practice or in further "school" practice for the machine gun.

In Article No. 133 are found regulations governing the expenditure of ammunition allotted for "test" practice.

11. Of the allowance of 100,000 blank cartridges, approximately 30,000 are allotted for instruction and 70,000 for field service and for use in the exercise of larger bodies of troops.

INSTRUCTION.

INSTRUCTORS.

and foremost the "detachment" commander
e for the instruction of the officers and noncom-
officers and soldiers of his command in target

the duty of the "detachment" commander to
expedite the instruction of his subordinates in
the principles laid down in the following articles,
elusive, remembering that proper instruction and
of the soldier in target practice and manipulation
oon depends in the highest degree on his own
ng, proficiency with the weapon, and energy.

rs and noncommissioned officers, however, should,
to an accurate knowledge of the weapon, acquire
ency in target firing that they will be able to
e to the gunners the capabilities and qualities of
and to locate any faults of the gun.

cer and noncommissioned officer must not only
uties in an engagement pertaining to his grade
and how to efficiently exercise them, but must
ared to actively support the "detachment" com-
he instruction of the men in the acquirement of
fire.

nstructor influences in a high degree by his per-
de the progress of the soldier. He must, taking
eration the characteristic qualities of the indi-
er, preserve and encourage the desire for and
target practice ordinarily inherent in the men.

THE SUPERIOR OFFICERS.

ommander of the body of troops to which the
n "detachment" is attached should assist and urge
target practice and instruction in a systematic
ic manner, fully supporting and considering the
action of the "detachment" commander. With
n view the following are to be observed:

ignment of the gunners taking last year's course
the machine-gun "detachment" a test is to be

made of the duties in the service and manipulation of the gun of those under instruction, viz:

Inspection and examination of the men in sighting and in estimating and measuring distances.

Tests of the preparation for and capability in the "battle-condition" firing, and likewise in fire discipline, conduct of fire, and in the combined work of leaders and gunners before, during, and after the firing stage of combat.

Method of conduct and supervision of the "battle-condition" firing.

METHOD OF INSTRUCTION.

17. Instruction of the gunner must advance step by step. While in all progress and improvement the individual characteristics and understanding of the gunners are to be considered, nevertheless close restriction to the *Firing Regulations* is indispensable to the full development of every individual duty and peculiar qualities of the gunner.

18. The instructor in commencing the preparatory drills explains in an intelligible simple way and without going into details the method of procedure in manipulation of the piece in firing and demonstrates the workings of the rear sight and manner of aiming. At the same time the arrangements of the targets, the different kinds of positions for the piece, and the gun carriage and parts pertaining thereto will be explained.

With the following instruction in aiming the soldier will be taught the manipulation of the piece, the loading and discharging of the same.

19. Then aiming and pointing in a standing position behind the gun carriage will be taken up.

20. Instruction in aiming and pointing lying down, sitting, and kneeling follow the instruction in aiming and pointing standing in their order.

21. Practice with blank cartridges concludes the preparations for practice with ball cartridges.

22. Only after thorough accuracy and certainty in aiming and pointing has been attained will practice with ball cartridges be commenced.

23. The most advantageous position for the instructor in the aiming and pointing exercises is, in general, to the left and front of the gunners. From this position the faults and mis-

most easily observed. However, it is permissible for the gunner to change his position as circumstances may.

Mistakes in sighting made by the gunner will be corrected to and explained.

Correct selection of the position in which the piece is to be fired, the proper choice of height of the piece above the ground, due consideration of the field of fire, full utilization of natural features of the terrain for cover, accurate estimation of distances, quick loading, rapid and sure operation of the rear sight, quick apprehension of the target, skillful aiming in the different body positions, quick clearing of any obstacle encountered in loading, rapid change in fire and height of piece above ground are indispensable tactical skill, without which the machine gun can not be brought into action with successful results.

The gunner must be continuously directed to an improvement of his ability of vision by sighting exercises at targets similar to those encountered in war at great distances and distinguished with difficulty.

POINTING.

According to the height of the machine gun from the ground, which is dependent upon the character of the ground, pointing is divided into standing, lying, sitting, and kneeling.

In all our manners of pointing the body must be held in a steady position and the gunner must grasp the handles of the gun with the fingers fully around them, must stiffen the arms, of the hands, elbows, and shoulders, and with his back to the machine gun.

In pointing standing, the gunner places himself with his feet apart in rear of the gun, bends forward as far as his build demands, and presses the arms close against the body.

In pointing lying down, the gunner places himself on the ground in rear of the piece with legs spread out, to an excessive degree. He must not cross his legs. The upper part of the body are raised as much as possible, the arms propped against or pressed close to the sides of the trail.

In pointing sitting, the gunner seats himself close to the rear of the piece. The legs are extended to the right

and left of the trail. The arms are supported against the thighs or pressed close to the breast.

29. In pointing kneeling, the gunner places himself in rear of the piece on one or both knees. The body in this position can remain erect or be thrown to the rear. The arms are pressed against the breast. The position of the lower legs and feet is left to the option of the gunner.

AIMING.

30. In aiming, the machine gun will be given such an elevation and position in azimuth that the object aimed at will be struck.

The elevation is obtained by first setting the horizontal bar of the rear sight at the graduation corresponding to the distance of the target; then, by the following operation of aiming at the selected object or target, the top of the front sight is apparently brought into the middle of the notch of the horizontal bar of the rear sight in such a manner that the top of the front sight is on the same line as the top of the horizontal bar of the rear sight—that is, half sight.

The movement in azimuth of the piece is accomplished by so moving the transverse cam that the line of sight and object are brought in the same right line.

EXECUTION.

31. Place the piece which is clamped along the center line of the trail in the proper pointing height, the muzzle toward the target.

After the piece is loaded and the rear sight is set, the sighting gunner moves the binding lever to the front and sets the coupling and locking lever at *open*. The piece is aimed on the target with both hands. The right hand presses the coupling lever down, so that it can reach the position *closed*. (Approximate elevation.) The piece is then accurately sighted by the right hand pulling the hand wheel and the left pushing on the hand-spike ring. (Fine elevation and lateral sighting.) The left hand places the locking lever at *closed* and draws the binding lever back. Both hands grasp the grips of the dolphins and the sighting gunner announces "1 (2, etc.) Ready!"

errors in aiming that occur most frequently are: using full or fine sight; the first causes the bullet to fall, the second in front of the target.

Swinging of the gun is caused by an improper position of the carriage or of the trail, when the sliding bar of the gun is not horizontal, but inclined to one side or the other. The deviation of the bullet is on the side toward which the piece inclines. In addition, under this condition, the bullet falls short of the target.

The correct position for the piece is made with the intrenchment necessary.

When in sighting, the top of the front sight is not in line accurately in the center of the notch of the rear sight to one side or the other, the bullet strikes to one side or the other of the target.

If the top of the front sight appears at the left of the notch, the bullet strikes to the left; if to the right, it strikes to the right.

The influences of light, wind, and temperature are to be considered to the gunners in a manner suitable to their capacities.

Special weight and importance are attached to the accuracy in accurate and rapid sighting.

The instructor must convince himself of the correctness of the roughness of its execution. The aiming exercises on the field targets used in "school practice," but as possible are to be extended to practice in the country with targets similar to objects encountered in war with objects themselves.

KIND OF FIRE.

Aside of the slow (single shot) fire which is employed in "school practice," two kinds of fire are distinguished, intermittent and continuous fire.

Intermittent fire is a sequence of about 25 shots, after which a pause is made to correct the position of the rear sight, to change the point aimed at, if necessary, and for the purpose of observing the effects of the shots. It is also used in obtaining the range and in exceptional cases, in attacking difficult targets or objects, especially in a rolling fire and at great distances.

In other cases, as a rule, "continuous fire" will be employed for effective results of fire, in which firing will be discontinued only when circumstances demand it.

37. The machine-gun fire is either with fixed elevation and lateral sighting, aim taken on some particular point ("point fire"), or it is a scatter fire—that is, the object fired at is played upon over its entire extent or some definite part ("scatter fire").

FIRING.

38. When he receives the command indicating the kind of fire, the aiming gunner raises the safety bolt with the right thumb and with the left presses the firing bolt forward until some resistance is felt.

He then places the right thumb also upon the firing bolt and fires. If it be necessary during the firing to manipulate the fine elevation sight with the right hand, the left thumb only remains upon the firing bolt.

It is to be borne in mind that only by firmly holding the piece and by an unintermittent, steady pressure on the firing bolt, can a steady accurate sight be obtained and maintained.

39. In horizontal or oblique "scatter fire" the binding lever must be loosened.

In the horizontal "scatter fire" both hands move the piece sidewise slowly and regularly; in the vertical and oblique "scatter fire" the left hand gives the piece its side motion while the right hand gives the fine elevation.

Against targets that are moving rapidly, or those in a very uneven country, both elevation and azimuth clamps may be fully loosened during the firing. Both hands remain on the handles.

The rapidity of the "scatter fire" depends on the distance and the character of the target. In general the weapon will be slowly and regularly moved. Too rapid movement of the piece destroys the fire efficiency.

40. At the commencement of the instruction the tendency of the gunner is to move the piece not only too rapidly, but also by jerks and starts. This fault must be energetically combatted.

on quiet movement of the piece is desired during the fire," not only in practice with ball, but also with cartridges.

The exercises begin with "scatter fire" against *field* No. 1 and against targets similar to those encountered in battle conditions in level country, and then will be changed to "scatter fire" against *field target No. 2*, targets in uneven country and against targets moving to the front, and sideways.

Fire will be taken at the foot of the target. In firing at short distances or after observation of the target, the fire, another position of the piece may be taken and, or in the case of faulty management and direction of the fire, may be chosen. In firing at movable targets moving to either flank, after due consideration of the direction of their movements and the distance of the firing position the latter will be so ordered or according to the circumstances so chosen that the target moves within the shot.

In case of more extended movement, the piece will either be ordered to correspond to the movements of the target or the point of aim again directed before the target. (For details of marching see Table 6.)

In firing on targets moving to the front and rear, the gunners will follow with the muzzle of his piece in the direction of movement.

With very good eyesight, and in exceptional cases, it is advantageous against both fixed and movable targets to take the fire without sighting, by observing the fall of the shells, raising the head to do so and changing the elevation and azimuth position during the firing.

Ordinarily but one elevation will be used in firing.

On a suitable depth of target or on account of difficulty of sighting accurately, two and in exceptional cases three elevations, varying by from 50 to 100 meters, will be justified.

With two elevations, the lower is taken by the right platoon. With three elevations, unless otherwise ordered, the extreme right platoon takes the lowest and the left platoon the highest elevation.

In certain circumstances, especially with deep or wide targets and difficulty of seeing properly, it may be

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advantageous to accomplish an extension of the beaten space by vertical "scatter fire" with but a small vertical angle. (Depth scatter fire.)

SCHOOL INSTRUCTION PRACTICE.

GENERAL REMARKS.

45. By means of the "school practice" all officers, non-commissioned officers, and gunners shall acquire and retain as high a degree of efficiency in target practice as possible and shall be qualified in the use of the machine gun in all kinds of pointing and of fire.

The "school practice" is to be considered solely as a preparatory training to the practice with fire under battle conditions. (*Battle condition practice.*)

46. The practice year begins the 1st of October of one year and ends the 30th of September of the following one, being designated by the latter year.

47. All officers, noncommissioned officers, and gunners take part in the "school practice," unless prevented by detached service, etc.^a

Every participant must, in the course of the practice year, be exercised in all the practice designated for his particular class.

The fulfillment of all exercises is to be striven for, but in the issue of extra ammunition and the repetition of exercises due regard is to be paid to the "Remarks on the exercises of the classes of firers."

48. In the choice of the day for exercise in firing due regard must be paid to the fact that unfavorable weather conditions have, especially in the primary instruction of the detachment, a disadvantageous influence.

Strenuous, wearying exercises must never precede the exercises of the *school practice*.

Every fore and every after noon counts as a distinct exercise day.

A rushing through of the exercises is as detrimental as a dilatory prosecution of the same.

^a Blacksmiths (or farriers), ordnance noncommissioned officers, trumpeters, officers' soldier-servants, and one ordnance assistant do not participate in the practice.

UNIFORM.

coat, chin strap underneath the chin, waist belt, cartridge, and field glass.

CLASSES OF FIRERS.

to the second class belong all those individuals who have received and profited by the full instruction of a gunner of the first class, all those who with success have passed the first class course.

Five of the junior and nine of the senior years' class are instructed as sighting gunners. (No. 2.)

Those who after the 31st of May rejoin from the hospital confinement, etc., and who formerly have not taken part in the course of the current year will receive target practice according to the orders of the detachment commander, and, if possible, will take part in the *battle condition*.

Those who return to duty with the detachment after the above-mentioned date will be given the full instruction down for their particular class.

The detachment commander assigns the officers to the different classes, selects the gunners for instruction as sighting gunners (No. 2), and, after completion of the instruction, promotes those qualified to the higher class.

Transfer of gunners from a higher to a lower class is not considered general efficiency; moreover, to such individuals to whom the demands of the higher class present difficulties the same care and attention must be devoted.

DUTIES OF THE DETACHMENT IN PRACTICE FIRING.

It is the duty of the "practice noncommissioned officer" (*Übungsunteroffizier*) to make preparations for the practice. He provides for the presence on the range of the ammunition, targets, writing material, wadding,^a firing regulations, and other regulations.

He apportions the duties of the fatigue party, superintends the target book and lists pertaining to the target practice, and oversees the repair of all apparatus and material used in the practice in the preparatory exercises. He has, in addition,

In all the firing exercises wadding must be placed in the ears.

tion, direct supervision over the machine gun, carbines and revolvers, ammunition, and ordnance material.

It is permissible at all times to detail a clerically qualified soldier to aid the "practice noncommissioned officer" in keeping the target record and lists.

53. Before departure for the range, before commencement and after discontinuance of the firing, it is the duty of the "gun leader" of every machine gun to examine with the wiping rod, especially to see if the barrel and ejecting tube are free from obstruction.

Report of this inspection will be made to the officer in charge.

These instructions apply strictly in every practice with both ball and blank cartridge.

The march to and from the target range is made under charge of a gun leader. Every gunner takes the small target book with him to the range.

To those charged with the supervision of the practice belong:

54. The officer who is responsible for all pertaining to the practice proper, for order and discipline at the firing points, and for the observance of all provisions of safety.

Before commencement of practice he convinces himself of the orderly and efficient condition of the piece, of the ammunition, of the firing points, and targets. Loadings and firing are executed upon his command only.

During the firing upon him specially devolves the guidance and instruction of the gunner, supervision of the clerk and markers. He sees that at the beginning of a pause in the firing the piece is immediately unloaded and that the bolt is taken from the breechblock before he gives the command for marking.

After cessation of the firing he attests the correctness of the recorded shots, the number of the "requirements" fulfilled, and the expenditure of the cartridges.

55. The noncommissioned officer on duty with the gunners under instruction oversees the execution of the loading. He sees that the piece is loaded only when the command for loading is received.

When the markers are not continuously under cover, the cartridges are to be drawn and the bolt taken from the breech-

re every marking, whereat the noncommissioned
inances himself that no cartridges remain in the cham-
tion tube. Report of this fact is to be made to
in charge.

ion the noncommissioned officer closely watches
they are signaled by the markers.

ficer be occupied in supervising the clerk, it is his
versee all of the movements and duties of the
der instruction.

noncommissioned officer or lance corporal charged
sue of ammunition superintends the ammunition,
himself that the belts are filled according to direc-
delivers the filled cartridge chests to cannoneer
carries them to the sighting gunner (No. 2). (See
(.))

ates the fatigue duty in the "detachment" prac-

clerk records the results of the practice, verified
rsigned by the officer or noncommissioned officer
et blotter and in the small target books previously
r to him by the men. These records are entered
cold weather an indelible pencil may be used.

detachment detailed for practice takes position a
n rear of the machine gun and opposite the target.
s are arranged according to number.

s position a single gunner steps forward and takes
n of sighting gunner (No. 2) as laid down in previous
any specified exercise and assumes the duties of

s at the command of the officer in charge. His
vements are laid down in paragraphs 25 to 44.

gunners not occupied in the service of the gun
ttention to the faults and obstructions and hin-
ssibly presenting themselves and to the explana-
eir perception and removal.

ions and hindrances must be overcome by the
nner (No. 3) aiding him when necessary. After
ted number of shots have been fired the gunner
artridges, takes the bolt from the breechblock, and
1 pace. After the result of the firing has been

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signaled he announces the record, stating his name, and resumes his place in the detachment.

If from extraneous causes the record of the gunner in question has been unfavorably influenced, appropriate remarks concerning the same will be entered in both blotter and small target book.

60. It is not permitted to allow the gunner to fulfill more than one "requirement" during one practice day.

61. To obtain apparently better results by a relaxation of duty which is prejudicial to a development necessary to efficiency in war is forbidden.

The use of shelter consisting of only roof and one side wall is permitted.

DUTIES AT THE TARGET.

62. The markers, consisting of a noncommissioned officer or lance corporal and the necessary number of assistants, will not be retained on duty at the targets for more than two hours in succession.

63. The noncommissioned officer or lance corporal bears the responsibility for the proper placing of the targets, for scrupulous location and marking of the hits, as well as for a careful pasting up of shot holes. No. 139 of the Military Punishment Law applies to incorrect marking in so far as the incorrectness is intentional.^a

Each year before the beginning of the target practice a clear understandable warning concerning the offense of false marking is to be delivered to the noncommissioned officers and men by the detachment commander. This warning is to be repeated before each practice by the officer in charge.

64. The targets will be placed perpendicularly on the car or stand so that they stand at right angles with the general directions of the range.

65. During firing at 25 meters the markers take position in rear of the detachment. During firing at greater dis-

^a No. 139 of Military Punishment Law reads as follows: "Whoever intentionally gives an incorrect service certificate or renders incorrect reports, official announcements, or official returns, or knowingly forwards such will be punished by confinement for from six months to three years and by reduction to the second class of soldiery. Less serious cases will be punished by light or close arrest or confinement or fortress confinement up to six months."

uties of the markers must be regulated according
umstances of the locality. In the first case the
ne markers may be dispensed with by the garrison
if the officer conducting the practice prefers to
e results of the firing in the presence of the men.
regulations concerning security and safety see
ulations for Infantry, paragraph 112.

Exercises of the classes of firers.

NO. 67.—SECOND CLASS OF FIRERS.

No. of exercise.	Dis- tance.	Target.	No. of shots.	Pointing position.	Method of the exercise.	Requirement.	Remarks.
1	<i>Meters.</i> 25	Field target No. 1	7	From trail lying down.	7 rectangles chosen by the instructor fired on singly. Single fire.	6 indicated rectangles struck.	The piece is so loaded that no cartridge will remain in the cartridge chamber. Azimuth angle fixed before each shot.
2	25	Field target No. 1	20	From trail lying down.	Intermittent fire on 1 rectangle chosen by instructor.	The selected rectangle hit. Extreme lateral spread of shots 8 cm. Not more than 3 shots outside of the field.	Azimuth angle fixed.
3	25	Field target No. 1	30	From trail sitting....	Continuous fire. Scatter fire over 1 field.	25 hits in 13 rectangles.	
4	25	Field pasted vertically.	20	From trail kneeling...	Continuous fire. Scatter fire over 10 rectangles.	15 hits in 7 rectangles.....	Limit of time of fire 20 seconds.
5	25	Field target No. 2	75	From trail sitting....	Continuous fire. Scatter fire over 30 rectangles.	55 hits in 22 rectangles.....	Limit of time of fire 1½ minutes.
6	400	Group target 44 meters.	5	From trail kneeling...	Single fire.....	5 hits, 10 points.....	Loaded as in 1. Marked after each shot; also coarse and fine elevation. To be brought to lowest position after each shot.
7	600	Group target 600 meters.	5	From trail sitting....	Single fire.....	4 hits, 8 points.....	Same as 6.

REMARKS.—In exercise No. 1 up to five and in exercises 6 and 7 up to three additional cartridges may be given. All exercises (with the exception of 5) may be repeated until fulfilled. Exercise 5 can be repeated but once. Exercises 6 and 7 may be held out of the order laid down, if range conditions demand it.

REMARKS.—In exercise No. 1 up to five and in exercises 6 and 7 up to three additional cartridges may be issued. All exercises (with the exception of No. 5) may be repeated until fulfilled. No. 5 can be repeated but once. Exercises 6 and 7 may be held out of the order laid down, if range conditions demand it.

Exercises of the classes of firs—Continued.

NO. 69.—EXERCISE FOR AIMING GUNNERS (NO. 2) FIRST AND SECOND CLASS.

No. of exercise.	Dis- tance.	Targets.	No. of shots.	Pointing position.	Method of practice.	Requirement.	Remarks.
Aiming gunner exercise.	<i>Meters.</i> 25	Field target No. 2.	150	From trail sitting.	Continuous fire. Scatter fire over 50 rectangles.	For second class 110 hits in 40 rectangles. For first class 120 hits in 42 rectangles.	Exercise may be once re- peated. Time of fire, greatest limit 1 minute.

DISTINCTIVE MARKS OF MERIT.

MARKSMANSHIP BADGES.

distinguishing good marksmanship, badges (breast
bestowed on the noncommissioned officers and
To the noncommissioned officers and reenlisted
h detachment—four to cannoneers of the first class,
ose of the second class—two badges will be given

who on account of poor and unsatisfactory prog-
target instruction are not advanced to the higher
xcluded from competition for badges during the
ear.

noncommissioned officers and gunners taking part in
itions must have shot through all the numbers of
and must have fulfilled all the "requirements"
t relating solely to the sighting gunner, which is
consideration.

is number those competitors receive badges who
ed the "requirements" with the smallest number
es; in the case of equal expenditure of cartridges,
receive badges who have made the most centers,
and hits, all of which, in this case, have an equal

who have gained marksmanship badges receive
from the detachment commander. The posses-
marksmanship badge by a soldier will be noted on
roll, discharge, and transfer papers (descriptive

n his discharge from the active list one marks-
adge of those to which he is entitled will be given
ncommissioned officer and gunner as his personal

Upon being recalled from the reserves or upon
return to the active list, the soldier will wear the
which he is entitled, if he has them in his possession,
by application through the commander of his pre-
ization the badges have been issued to him upon
t of the money value of the same.

73. Reduction to the second class of soldiery debar the soldier from possession and acquisition of the marksmanship badge. Upon rehabilitation badges so lost may be won by the soldier.

PRIZES OF HONOR.

74. Every year a prize competition with machine guns will be held for the noncommissioned officers of the gun detachments.

Based upon the results of this competition, the best marksman of all the machine-gun detachments receives a prize donated by His Majesty.

The prize is a watch, upon which is engraved the name of the winner and the reason for its donation.

75. This prize competition will be held in the month of July or August. During the designated period the practice days will be so chosen on the part of the detachments that the firing will take place under as favorable external conditions as possible.

76. Those noncommissioned officers take part in the competition for the prize who have taken part in the *school practice* and who, on the day set for target competition, are present at the firing point and not hindered from taking part by urgent duty or sickness.

Noncommissioned officers who have already received a watch as a prize for excellent target practice with the machine gun are debarred from further competition for the same.

77. Method of execution: Target: Field target No. 2, but with 150 rectangles, each 2 centimeters wide. Distance: Twenty-five meters. Two hundred and fifty shots: Firing from carriage, lying down, continuous fire, scatter fire upon 150 rectangles.

Primarily the number of hits within the rectangles decides the competition, then the number of hits. If these also be equal, then he is given the prize who, under the conditions laid down in No. 70, has attained the best record in *school practice*.

78. The machine-gun detachments announce to the inspection department of the *Jäger und Schützen*, through official

the name of the best shot, with the record of his hits
rd in the *school practice*.

department ascertains the best marksman of all
nents and forwards name and target records to the
department by the 5th of September of each year.
general war department, basing its action upon the
mitted in accordance with No. 79, forwards the
to the winning machine-gun detachment, which
it to the winner with proper, befitting ceremony.
ddition, the name of the noncommissioned officer
lished to all the machine gun-detachments and to
l to His Majesty in the summary of the target

winning of the honor prize will be noted on the
s, as well as on the discharge and transfer papers.

SIGHTING PRIZES.

increase the zeal in aiming, a first and second prize
test will be held in each detachment yearly. For
e each detachment will receive 20 marks.

ey so received is in its entirety to be expended for
ch are to have the character of memorials and, if
re to be engraved or marked with appropriate

g of money prizes is inadmissible.

tion of the aiming prizes is to be made in the rec-
e same manner as in the case of marksmanship
71).

FIRST-PRIZE AIMING CONTEST.

the first contest all the gunners in the primary-year's
part, with exception of those of the second class of

the machine guns of the detachment will be taken
e of the contest for this purpose. The contest
before the primary class (first year's) begins the
tion practice.

machine guns, in battery, are formed about ten
t at equal pointing heights and pointing in the
ion.

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The gunners take the appropriate position for aiming. Eight sights will be directed to be taken against targets to be decided upon by the detachment commander.

88. Each gunner immediately after completing his sighting calls out the number of his piece and at once resumes the attention.

The results, in the order in which the gunners complete the aiming, will be entered on the proper form (Model No. 4) by an officer.

After an aim has been taken the piece remains unaltered in its position. The test of the aiming is made by one and the same officer.

Aiming is "good" when the rear sight is properly fixed as well as elevation and side sight sharply taken.

89. The result is indicated in the form (Model No. 4) with the "good," or, if the above requirements be not fulfilled, by "_____".

Only those cannoneers who have at least six "good" sights can lay claim to a prize. With this condition fulfilled the smallest total of the different "points" decides the winner.

For every false aiming six points are added. The two best sighters receive prizes.

SECOND-PRIZE SIGHTING CONTEST.

90. The second-prize sighting contest will be held at the conclusion of the target exercises. All the gunners of the first class, as well as those of the primary course who have received instruction as sighting gunners, take part in this contest.

Conditions governing the second contest are the same as those of the first contest. The two best sighters receive prizes.

ESTIMATING AND MEASURING DISTANCES.

91. For this instruction the requirements laid down in articles 70 to 81, *Firing Regulations for the Infantry* and the provisions laid down in the *Regulations Concerning the Large Range Finder* (Hahn) govern.

BATTLE-CONDITION PRACTICE.

the battle-condition practice is the ultimate object and whole target instruction, and therefore is the most important part.

Should give officers, noncommissioned officers, and privates opportunity to perfect their skill in target practice, as far as possible, under conditions approaching the reality as far as possible, the rules laid down for training under war conditions.

Battle-condition practice is divided into practice with the machine gun, practice with the platoon, and practice with the detachment.

Practice of the single piece and of the platoon is conducted within the detachment.

Practice of the detachment is conducted by the commanding officer of the body of troops to which the detachment is attached.

Of the 60,000 cartridges apportioned to the battle-condition practice about 25,000 will be used in the practice with the machine guns, about 17,000 in the practice of the platoon and the remainder in the practice of the detachment.

PERSONNEL AND METHOD OF PROCEDURE.

Battle-condition practice, which is always conducted under the supervision of an officer, the following persons take part in it:

1. Sighting gunners (Nos. 1, 3, and 4) all those who, as stipulated, take part in the school practice.

2. Sighting gunners (No. 2) all those detailed for duty as such. The arbitrary selection of specially-sighted gunners for duty with the guns during the battle-condition practice is not admissible. Every effort must be made to attain with all the sighting gunners an equally high degree of efficiency.

3. Practice on any one day be directed against several targets against one target several times, the sighting gunners be changed after each series of shots. It may be that in exceptional cases an immediate repetition of the series with a different sighting gunner will be changed after each series of

98. As gun leader: all the noncommissioned officers, reenlisted men, and specially qualified men of the last year's course.

Special value is to be placed upon the instruction of the gun leaders in observing the fall of shots, in addition to their other duties.

99. As platoon commanders: the senior lieutenants, lieutenants, and senior noncommissioned officers.

100. As detachment commanders: the captains, senior lieutenants, and lieutenants.

101. All officers, noncommissioned officers, and privates not prevented by other duty are to be present at all *battle-condition practice*.

102. The uniform is the same as laid down for the *school practice*, except that, in addition, revolvers, carbines, intrenching tools, haversacks, and canteens are to be carried.

103. The instructions for placing targets for the *battle-condition practice* are the same as those for placing *battle-condition targets* for the infantry.

104. In the placing and locating of cover the fact must be taken into consideration that on account of the rapid succession of shots the close contracted shot sheaf of the machine gun has a greater destructive effect on, and consequently greater penetration in, the cover in a short time than that of the single shot. The marker's covers are therefore to be completely sunk beneath the surface of the ground, or, if this be not practicable, to be placed outside of the line of fire and to be made especially strong.

105. The *battle-condition practice* takes place in the open country upon the target range, drill ground, or upon the garrison drill ground, in so far as the latter adapts itself to the purpose.

106. In all practice under battle conditions with ball cartridges the selection of the place should be made with the greatest precaution, in order to eliminate chances of accident as far as possible.

With this same end in view practice in cold frosty weather is to be avoided as far as possible. Hard frozen ground and ice surfaces are not only conducive to direct ricochets, but also to those oblique to the line of fire.

During the practice the country within the danger zone must be guarded and interdicted to all persons not connected with the practice.

one in general extends 4,000 meters in the direction and 650 meters to the right and left of the outside lines

greatest precaution is ordered to be taken in practice of movable targets, especially at short distances. The officer in charge may, after suitable investigation and consideration of the local circumstances, decrease the limits of the danger zone. (See *Range Order*.)

The men detailed to secure immunity from accident are to be outside of the danger zone. They keep a standing up position.

The officer in charge decides who of them have only the duty of giving warning and who of them have the rights and duties of those detailed for guard duty. The first named are in *orderly* uniform the latter *garrison guard* uniform.^a

Those detailed for warning duty only must, however, be by force the entrance within the danger zone of all who apparently do not understand the warning—as, for example, those who do not understand the language or whose intelligence is not sufficient to appreciate the danger, such as children, insane persons, etc.

Markers and laborers are to be placed under reliable supervision (in greater practice, under that of officers), and in case they are not able to find cover in the vicinity of the target they are to be withdrawn to the firing point.

The duties of the markers, in connection with the details, must at practice, must be thoroughly regulated and must be the same as in previous to practice.

CONDUCT OF FIRE AND FIRE DISCIPLINE.

In regard to delivery of commands, conduct of fire, and fire discipline reference will be made to the requirements of the *Regulations*.

The officers in charge of the practice should direct attention chiefly to the proper distribution of the fire over the whole extent of the targets, in which case fire is to be directed against some particular point (*point fire*) and when

^aTranslator's note.—*Orderly* uniform (*ordonnanzanzug*): Dress coat; long trousers; in wet weather worn inside the military shoe top); helmet; chin strap up;

Garrison guard uniform (*garrisonwachtanzug*): The same as above but with cartridge box added.

scatter fire is to be used depends upon the character of the target.

113. If it be necessary to fire a number of shots to obtain the range, *intermittent fire* will be used and directed against a particular point of the target. Such points are to be selected as are most plainly visible to the firer. As in the majority of cases the striking of the shots is more easily observed before than behind the target, it is better to choose an elevation so low that in all certainty shots will be expected to strike in front of the target.

PREPARATORY EXERCISES.

114. Blank or dummy cartridges are used in the preparatory exercises.

115. Targets fulfilling field conditions or detachments that move in accordance with preconcerted signals serve as targets. The use of flags to represent artillery or cavalry is not to be recommended.

The presentation of different targets in a variable country and at unknown distances, different estimates of time corresponding to the reality in which the target is assumed to be in sight or ready, as well as different measurings of the time for bringing the machine gun into action, train the eye and capability of coming to a decision of both leaders and gunners.

FIRING WITH SINGLE MACHINE GUN.

116. Next come the exercises with the single machine gun. The officers act as instructors and the noncommissioned officers and reenlisted men serve as gun leaders.

117. Firing with the individual machine gun shall give as much as possible opportunity to gun leaders and gunners for independent action.

A single "requirement" or "condition" in which the gun leader is to act as though he were acting with a platoon is, therefore, to be taken as the basis of each exercise.

118. Exercise will next be given in placing the machine gun for action and in the duties and movements of gun leader and gunners up to the time for the appearance of the target, the instructor making explanations in detail and, if necessary, making corrections.

The instructor permits the gun leader to give the command necessary for opening fire.

Gunnery must be closely watched in the execution of exercises, especially to see that they locate the targets, place the piece properly in position, set the rear sight as well as aim the gun quickly and accurately.

Early in the beginning, opportunity will be offered to the instructor to often discontinue the exercise and convince the gunner that the gunner has chosen the proper place on which to place the gun.

During attention to the fall of the bullets, changes in position, and the presentation of other targets, the instructor directs the firing leads gun leaders and gunners to rapid action.

The first easy targets are to be used; later, more difficult

targets, such as movable targets is to be made the object of frequent exercise. Concerning the amount of and manner of firing allowances for laterally-moving targets and general certainty must be attained. (See also paragraph 6.)

EXERCISES OF THE PLATOON AND OF THE DETACHMENT.

Exercises by platoon and detachments follow in succession after the completed training with the single machine gun. In exercises with the single piece the primary object is the instruction and preparation of the gunners and gunners, so in these exercises special attention is paid to the schooling and development of the leaders without losing sight of the action and efficiency of the gun.

The exercises are held in a manner similar to those with the single gun. The detachment commander and senior officers act as instructors; the junior officers and senior non-commissioned officers act as platoon leaders.

At the beginning of the exercises it must not be forgotten that the conditions, which demand the independent action of the platoon, must be brought to a realistic representation. Like the progress of the combat is to be simulated under the hypothesis of losses.

EXERCISES WITH BALL CARTRIDGES.

122. Practice with ball cartridges is held in a manner similar to that with blank cartridges. Such targets are to be preferred as will in war, to the greatest extent, be offered as objects to be fired on by machine-gun detachments. (See *Drill Regulations*, part 2.)

Great value is therefore to be laid upon the practice at movable targets as well as at those that remain in sight but a short time.

Practice in firing at objects at great distances must be held as often as practicable.

123. Simple tactical hypotheses are to form the basis of the exercises, throughout which the aim and object of the practice, instruction, and perfection of the troops in target practice must always be held in view.

The problem must then be made known to the leader and the troops at the time it is to be solved.

124. Selection and occupation of the firing point is to be left to the leaders. Limitations shall be imposed only when considerations of safety demand it. Gross mistakes in the selection of the range are to be corrected in seasonable time, in order to prevent a useless waste of the limited ammunition allowance and also not to impair the confidence of men in the weapon.

During the pauses or after the completion of the practice, the score is to be taken and made known to the practicing detachment.

At the beginning of a pause in the firing, cartridges are to be drawn immediately.

125. Primarily, the number of figures hit and the time of fire determine the decision in regard to the scores made; secondarily, only the number of hits compared with the number of cartridges fired may be taken into consideration.

126. The scores are to be recorded upon "hit strips" (*tref-fer streifen*) by the markers, as by this method the distribution of fire and the results obtained by individual machine guns can best be perceived.

127. For every *battle-condition practice* a target list in accordance with Form 3b is to be placed in the target book. These lists serve as a basis for judging the efficacy and proficiency of the individual machine guns, platoons, and detachments.

statements must, therefore, be absolutely reliable. Every superior wish to be informed concerning the results of any special exercise or exercises at which they have not been present, the reports called for shall be made in a concise form and without extensive diagrams.

CORRECTION PRACTICE.

The *correction practice* shall make evident not only the efficiency of the machine gun, but also the conditions under which it attains its highest efficiency, thereby plainly and practically demonstrating the principles for the proper use of the machine gun.

Correction practice offers not only an excellent means for the advancement of an instructed, experienced, and developed personnel, but is also well adapted to the instruction of new personnel in their duties and actions in case the proper use and conduct of the firing be lacking.

Correction practice is to be conducted by the detachment commander in the presence of the officers, noncommissioned officers, and men of the detachment shortly after the detachment have joined.

In the arrangement and direction of this practice it is to be so conducted that all possible influences that affect the results of the firing may be eliminated. On this account this practice shall be conducted at known distances and under favorable weather conditions.

Provisions for the safety of persons in the surrounding area and of the markers laid down for *battle-condition* shall be maintained for *correction practice*.

Correction practice firing with single shots and with a line of targets of different target qualities firing at a single target shall be forbidden, as never with the single shot, but with the line of targets is to be reckoned.

The tests of penetration of the machine gun are to be conducted in accordance with par. 178 of the *Firing Regulations of the Infantry*.

To test the efficacy of the machine gun at night, the target shall be set up and trained during daylight, fastened in place and watched.

The firing itself will not begin before it has become completely dark.

TEST PRACTICE.

132. Each year a *test practice* will be held in the open country.

The object of this practice is to give the higher officials opportunity to observe the proficiency in target practice under conditions which approach war conditions as much as possible.

The *test practice*, which always has the character of an inspection, will be conducted under the direction of the inspector of the *jäger und schützen*.

133. The exercises are to be planned and conducted in such a manner that correct ideas of the insight of the leaders and of the proficiency of the men will be attained. Should the carrying out of the *test practice* be impracticable during any target year, the cartridges destined therefor shall, by order of the inspector of the *jäger und schützen*, be expended either in further practice under war conditions or be held for a similar object during the next year.

The same rule holds when the ammunition allotted for the *test practice* is not fully expended.

134. Short reports of the *test practice* are to be incorporated in the target reports. In them must be noted the target proficiency, under war conditions, of the individual detachments.

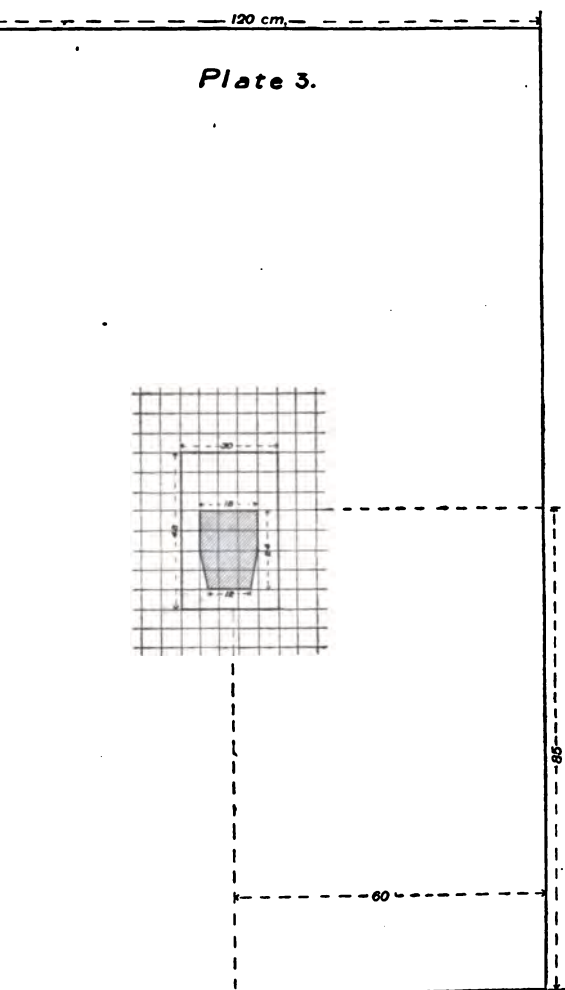
MACHINE-GUN TESTS.

135. The gun tests are to be conducted during favorable weather, not during extreme cold or heat, with thoroughly reliable, correctly shooting gunners. They are to be conducted in a thorough manner, without over hastening or overtiring the gunners. All necessary measures for the attainment of unobjectionable results and for the avoidance of faults of execution and handling are to be taken.

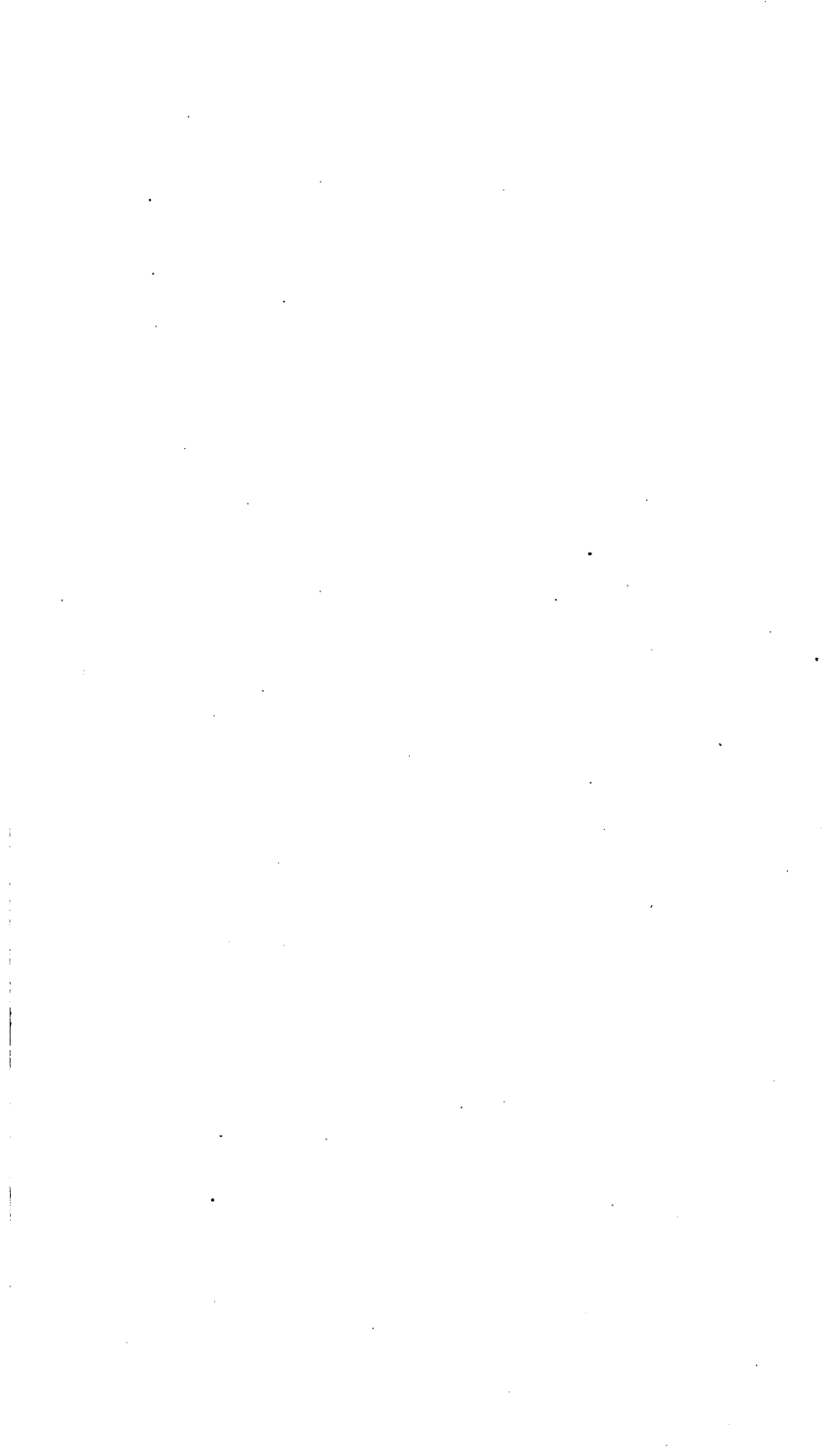
The rear sight must not be white or glistening and must be sheltered from the direct rays of the sun.

As a rule, each machine gun will be tested but once during any one exercise day. The object of the test is not attained, if, in case of unfavorable results, different gunners are permitted to fire the piece, until finally a satisfactory target is made.

Only in really doubtful cases shall the tests by another gunner be repeated during the same day.



TARGET FOR MACHINE-GUN TEST. (PAR. 136.)



White target (Pl. 3) will be used at a distance of 150

Machine gun will be fixed on the lower frame of the
 firing at the kneeling and lying down positions.
 In case of necessity, must be strengthened by nail-
 upon the resting place of the ground spikes and
 rts, so that a firm position of the machine gun will
 ly assured.

er takes the position of "pointing kneeling" upon
 rear sight at 250, aim taken at bottom of the
 center).

tests must be held under the supervision of an
 noncommissioned officer is in charge of the target.
 Machine guns will be tested only:

er repairs, after which a test is necessary according
 for the repairs to machine gun material."

can,
 test be made or trial shots be delivered at the dis-
 the ordnance officer or of the detachment com-

a new machine guns.

a newly installed barrels.

a barrels that have been used, when they seem to
 e of faulty fire execution by the machine gun.

ring under 137 (A) five shots and under 137 (B)
 s will be fired. Marking of the shots is not per-

sts of a gun under 137 (B) be not satisfactory,
 rmation is to be transmitted by signals) to com-
 hart two more shots are fired by the same gunner.

of each individual gun will be indicated by the
 sioned officer on duty at the targets upon a shot
 then the target will be pasted. (This shot chart
 d copy of the target; scale 1:10, upon which the
 ater) is indicated in outline).

ch chart will be noted the date, number of the
 n and of the barrel, the name of the gunner, and
 spread of the shots, in centimeters.

Machine gun is considered satisfactory when in the
 137 (A), four, and under 137 (B), all three shots
 x the *rechteck* (rectangle), and the vertical spread
 ets (the vertical distance from the lower edge of

the highest shot hole to the upper edge of the lowest) is not more than 30 centimeters.

The shot charts of tests held during the target year are to be preserved for this and the coming target year and are to be submitted at the *weapon inspection*.

139. If the test of a machine gun under 137 (A) or 137 (B) be not satisfactory, in every case the gun, including the barrel with "deficiency label" renewed, is to be tested and repaired at the ordnance work shops.

The irreparable deficiencies of the gun with corrections for the same will be noted on the "deficiency label."

If a second test of a machine gun be not satisfactory, the process is repeated until it be evident that the guns can not be brought to the requisite fire efficiency. Then the gun, with its barrel, will be sent to the gun factory at Spandau, with a report giving reasons for this action and with shot charts.

140. When the fact of faulty fire execution is established by trial shots, the machine gun, including barrel with "deficiency label" and report of the striking points of the trial shots, will be forwarded to the ordnance workshops. The gun test under 137 (A) then follows.

A possible further investigation is held under provisions of paragraph 139.

TARGET BOOKS AND REPORTS.

141. The detachment target book (in single sheet) begins with a summary of the completed "requirements", the individuals numerically arranged in classes, according to the rank of officers, noncommissioned officers, and gunners, and arranged alphabetically in each grade. (Form 1.)

Next follows a summary of the target days and of the ammunition expended. (Form 2).

Next in order come the shot lists for *school practice* (Form 3^a) and for *battle-condition practice* (Form 3^b). A duplicate of the target report of the detachment concludes the book.

142. The following marks are used to indicate the character of the shots, viz:

0=Misses.

00=Ricochets that have struck the target.

R=*Rechteck* (rectangle).

+ =Hits in field or figure targets.

1, 2, 3=Hits in "division" of the target (above and below centers) 1,2,3.

Attachment target books are renewed each year and by the detachment commander in regard to the stand.

The detachments take with them to the target range from which the results of the practice are transferred to the "target book," which is always kept posted up to date. Examination of the target books makes it possible for the officers to follow the course of instruction and the progress of the detachments in the progress of the

to abstracts from the target books and to determine the target efficiency of a detachment by a comparison of the number of shots fired and hits made is not

is forbidden to give special instructions concerning the keeping of the target books and blotters; only the detachment commander has authority, within the limits of these regulations, to give instructions concerning the

SMALL TARGET BOOK.

The soldiers' small target book contains the number of shots fired by the gun, marks indicating results of shots, shot lists of the exercises of the appropriate class in *school* of marksmanship, certificates concerning changes in classes, marksmanship, and aiming prizes.

The small target book is kept in the possession of the soldier to whom it is delivered to the clerk on the range for the purpose of having his record entered. The book is returned to the soldier when he leaves the range.

TARGET REPORTS.

The machine-gun detachments forward to the battalion commander 10 of each year, the target report according to

The battalions forward the reports of the detachments to the inspector's department of the *jäger und schützen* by the

Form No. 3A.

Shot List No. _____
 _____ Class of Firers.

Machine Gun No. _____
 Gunner _____.

3	4	5	6
Day of exercise.	Statements of the re- sults. Se- quence of the shots.	No. of shots, dura- tion of the fire in seconds.	Remarks.

Exercise in school practice.

			<p>Here belongs everything necessary to elucidate the progress of instruction and explain unusual occurrences, as, for example, retirement, detached service, transfer, extended leave of absence, or sickness; reasons why a participant has fired his exercises at long intervals or shot several of them one after another in a short time; statement of the cause if the number of cartridges allotted for particular exercises are not fired during any one practice day, of any exceptional facts concerning the gun, of test shots, of gun test, of broken bullet jackets or shells, of defective cartridges, or of miss fires, etc.</p>

"Battle condition practice" with single machine gun:
 "Battle condition practice" with platoon:
 "Battle condition practice" with detachment:
 higher class of firers:
 for marksmanship:
 or aiming.

FORM NO. 2.

Summary of the practice days and ammunition expended.

1	Running number.											9
2	Day.											8
3	Practice days.											7
4	Month.											6
5	Those taking part in the exercises.											5
6	Class of firers.											4
7	I.											3
8	II.											2
9	Officers.											1
10	Non-commissioned officers.											0
11	Reenlisted gunners.											0
12	Officers.											0
13	Non-commissioned officers.											0
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258	Officers.											0
259	Non-commissioned officers.											0
260	Reenlisted gunners.											0
261	Officers.											0
262	Non-commissioned officers.											0
263	Reenlisted gunners.											0
264	Officers.											0
265	Non-commissioned officers.											0
266	Reenlisted gunners.											0
267	Officers.											0
268	Non-commissioned officers.											0
269	Reenlisted gunners.											0
270	Officers.											0
271	Non-commissioned officers.											0
272	Reenlisted gunners.											0
273	Officers.											0
274	Non-commissioned officers.											0
275	Reenlisted gunners.											0
276	Officers.											0
277	Non-commissioned officers.											0
278	Reenlisted gunners.											0
279	Officers.											0
280	Non-commissioned officers.											0
281	Reenlisted gunners.											0
282	Officers.											0
283	Non-commissioned officers.											0
284	Reenlisted gunners.											0
285	Officers.											0
286	Non-commissioned officers.											0
287	Reenlisted gunners.											0
288	Officers.											0
289	Non-commissioned officers.											0
290	Reenlisted gunners.											0
291	Officers.											0
292	Non-commissioned officers.											0
293	Reenlisted gunners.											0
294	Officers.											0
295	Non-commissioned officers.											0
296	Reenlisted gunners.											0</

FORM No. 4.

Compilation of the results of first (second) prize-aiming contest.

Name.	1 Aiming.		2 Aiming.		3 Aiming.		4 Aiming.		5 Aiming.		6 Aiming.		7 Aiming.		8 Aiming.		Résumé.			Remarks.
	No. (*)	Aim- ing.	No.	Aim- ing.	No.	Aim- ing.	No.	Aim- ing.	No.	Aim- ing.	No.	Aim- ing.	No.	Aim- ing.	No.	Aim- ing.	Total of the num- bers.	Marks for failures in aim- ing each failure 6.	Total of points.	
Gunner A.....	4	Good.	6	Good.	4	Good.	5	Good.	2	.....	3	.....	6	Good.	4	Good.	34	12	46	
Gunner B.....	1	Good.	1	Good.	2	Good.	3	Good.	1	.....	1	Good.	1	Good.	1	Good.	10	6	16	1st prize.
Gunner C.....	2	Good.	2	Good.	3	Good.	4	Good.	2	Good.	4	Good.	2	Good.	2	Good.	21	.....	21	2d prize.
Gunner D.....	6	Good.	5	Good.	6	Good.	3	Good.	3	.....	3	.....	4	.....	3	Good.	33	18	51	
Etc.....																				

* In these columns are entered the numbers indicating the order in which the aimings of the different gunners are completed.

Name:

Rank:

Date and place:

TRANSLATIONS PERTAINING TO MACHINE GUNS. 199

FORM No. 5.

Target report.

Designation of the detachment.			Officers.	Noncommissioned officers and reenlisted men.	Gunnery.	Of these are in—					
						1.		2.			
						Class of firers.					
								Officers.	Noncommissioned officers and reenlisted men.	Gunnery.	Officers.	Noncommissioned officers and reenlisted men.	Gunnery.
Strength October 1, 19—											
Losses:	Those who have not begun the exercises.	A On det. service.									
		B C									
	Those who have not completed the exercises on account of removal.	A On det. service.									
		B									
		C									
Gains:	Total.										
	A Transferred to detachment.										
	B										
	C										
Those who had to fire all the exercises. (s. 1+3-2.)											
Strength, given un-1, 2, 3, 4, 5 have—	A. Not fired all the exercises.										
	B. Have fired all the exercises, but have not fulfilled all requirements.										
	C. Have fulfilled the requirements of all exercises.										
Of the above are to be advanced to the next class.											

E.—Ordnance noncommissioned officer, blacksmith (farrier), trumpeter, driver, veterinary detachment tailor, hospital noncommissioned officer or lance corporal are not to be included on this report.

200 TRANSLATIONS PERTAINING TO MACHINE GUNS.

I.—ILLUSTRATION.

To No. 2. Losses :

Not begun :

1. Gunner X., soldier servant to Capt. Z.
2. Sergt. Y., sick since October 10, etc.

Begun, but not completed :

1. Lance Corpl. H., transferred to Yeager Battalion April 25.
2. Gunner M., in fortress, arrest since June 22, etc.

To No. 3. Gains :

1. Non-com. officer P., transferred from Yaeger Battalion to the detachment Jan. 4.
2. Capt. R., transferred to the detachment as its commander May 8.

To No. 5A. Not fired all the exercises :

1. Lance Corpl. H. attached as re-enlisted man July 17.

II. Have received marksmanship insignia :

III. Have received aiming prizes :

IV. Battle condition practice has been held :

A. With single machine gun.

B. With platoon.

[C. With the detachment.

Date :

Place :

V. Other remarks of importance by detachment commanders.

Place :

Name :

Date :

Rank :

FORM No. 6.

Distances passed over by marching troops during time of flight of bullet (in meters).

Distances (meters).	I.—Foot troops.		II.—Mounted troops.		
	Quick time in one min- ute. (100 m.)	Double time in one min- ute. (150 m.)	At the trot in one min- ute. (250 m.)	At the gallop in one min- ute. (400 m.)	At the run in one min- ute. (650 m.)
100	0.35	0.50	0.80	1.30	2.10
200	0.65	1.00	1.65	2.65	4.30
300	1.00	1.50	2.50	4.00	6.50
400	1.45	2.15	3.60	5.65	9.25
500	1.90	2.85	4.75	7.60	12.35
600	2.35	3.50	5.85	9.15	15.00
700	2.85	4.25	7.10	11.35	18.45
800	3.40	5.10	8.50	13.60	22.10
900	4.00	6.00	10.00	16.00	26.00
1,000	4.70	7.00	11.70	18.70	30.40
1,100	5.40	8.00	13.40	21.40	34.80
1,200	6.10	9.15	15.25	24.40	39.65
1,300	6.80	10.20	17.00	27.20	44.20
1,400	7.60	11.40	19.00	30.40	49.40
1,500	8.45	12.65	21.00	33.65	54.65
1,600	9.30	14.00	23.25	37.25	60.50
1,700	10.20	15.30	25.50	40.80	66.30
1,800	11.15	16.70	28.00	44.70	72.70
1,900	12.15	18.25	30.35	48.60	78.95
2,000	13.20	20.00	33.00	53.00	86.00

FORM 7.

● Direct Hits } in the figures.
 X Ricochet = }
 ○ Direct = } outside of figures.
 ● Ricochet = } but in target.

	Figures
Direct Mils.	Ricochet Mils.
	Not in Figures.
Direct Mils.	Ricochet Mils.
Total Mils.	

TARGET.

[illegible]

Direct Hires.

Ricochet Hits.

Figures Mit.

(Name of Scorer)



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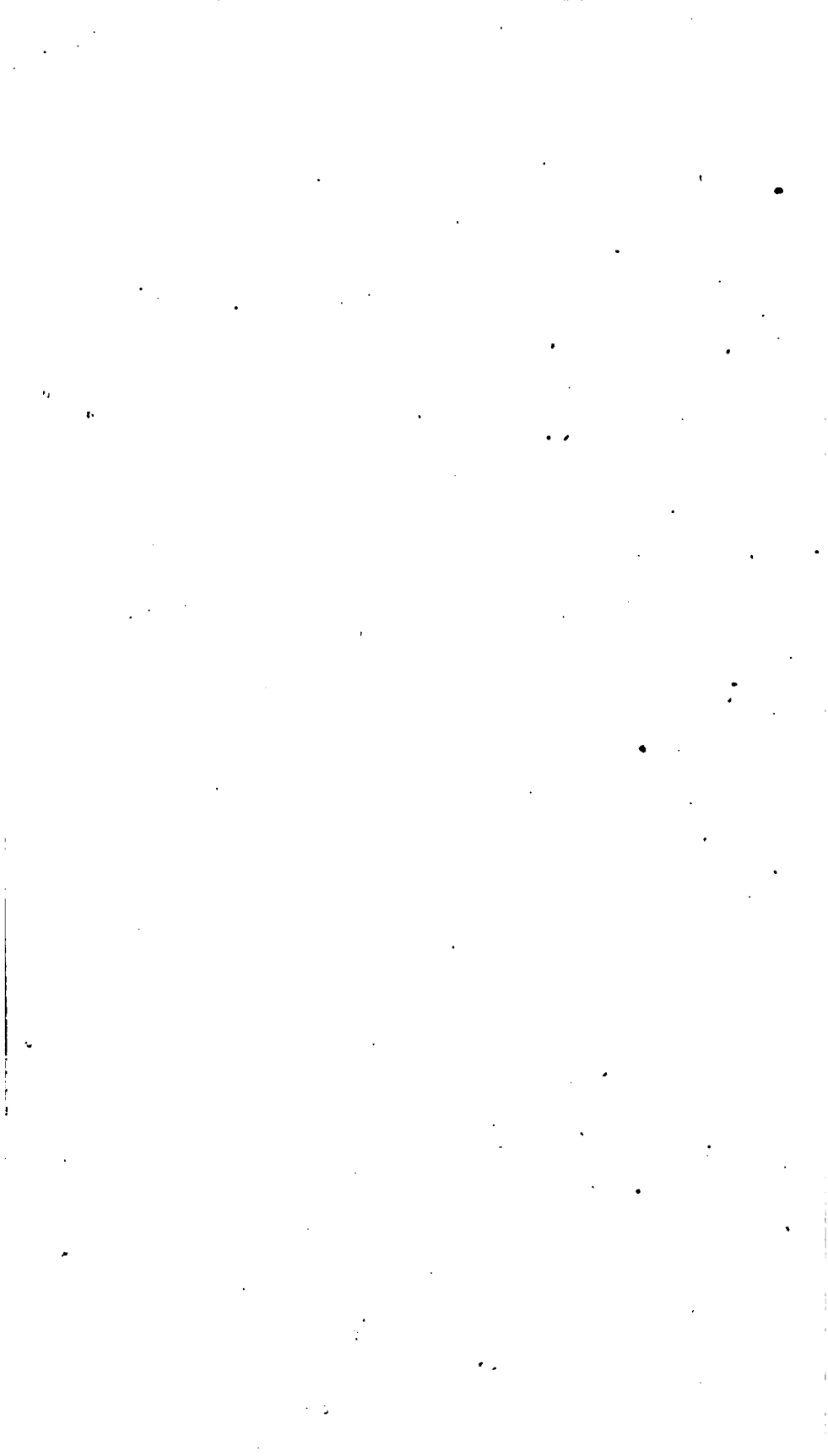
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